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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 55603-56651.

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55603-56651

APRIL 1976

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

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VOLUME 7, NO. 4 APRIL 1976

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

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APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

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Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

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PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

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Geomet, Inc., 15 Firstfield Road, Gaithersburg, Maryland 20760

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General Electric Company, Information Systems Programs, 1755 Jefferson Davis Highway, Suite 200, Arlington, Virginia 22202

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Louisville Gas and Electric Company, P. O. Box 354, Louisville, Kentucky 40201

Contract No. 68-02-2363, RFP No. Du-76-C187 .... *$27,500*
EPA PLANS TO EXPAND THE SAMPLING AND ANALYSIS FOR NITROSAMINE COMPOUNDS TO THE AREAS OF NEW YORK, BOSTON, NEW JERSEY, AND BELLE, WEST VIRGINIA.
Thermo Electron Corp., 101 First Avenue, Waltham, Massachusetts 02154

Contract No. 68-02-2151, RFP No. Du-75-A277 .... *$301,000*
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Aerotherm/Acurex Corp., 485 Clyde Avenue, Mountain View, California 94042

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Contract No. 68-02-2292, RFP No. Du-76-B119 .... *$828,014*
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NEOPLASTIC AND LIFE SPAN EFFECTS ON POTENTIALLY SENSITIVE POPULATIONS OF RATS CHRONICALLY EXPOSED TO TRITIATED WATER.
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Technology Service Corp., 2811 Wilshire Blvd., Santa Monica, California 90403 (NOTE: Contract contains options in the amount of $26,021)

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1975

55603 **APTIC NO. 73625**

Andrzejewski, R.

ASSAY OF A RELEVANCY ORDER OF HARMFUL DUSTS EMITTED IN NORTHRHINE- WESTPHALIA. *(Ein Versuch zur Aufstellung einer Relevanzreihe der in Nordrhein-Westfalen emittierten gefaehrdenden Staeube). Text in German. Schriftenreihe Landesanstalt Immissions und Bodennutzungsschutz Landes Nordrhein-Westfalen, Essen, no. 33:9-16, 1975. 6 refs.*

An attempt at the setup of a relevancy order of hazardous dust emissions and at weighting differeint types of emission sources is presented. The respective contributions too the overall hazardous dust emission in Northrhine-Westphalia from industry including electricity generation, domestic heating including small-scale industry, road construction, and traffic are 54.4%, 33.6%, 8.6%, and 3.4%. Combustion processes, technological processes, and non-combustion processes account for 66.1%, 19.7%, and 14.2%. The respective shares of silica-containing dusts, soot, heavy metal oxides, and other dusts are 49.6%, 30.4%, 15.1%, and 4.9%. The average emission load amounts to 8 mg/sq m/day, and it ranges from 9 to 90 mg/sq m/day in highly polluted industrial areas. Based on the emission rates and degrees of noxiousness, heavy metals can be arranged in an order of decreasing relevancy: iron, lead, zinc, vanadium, arsenic, nickel, beryllium, copper, cobalt, and chromium. The relevancy order for toxic elements ranges from iron, lead, arsenic, nickel, copper, to molybdenum, while the relevancy of highly toxic elements decreases in the order vanadium, beryllium, chromium, and cadmium. The relevancy of carcinogenic elements decreases in the order iron, zinc, arsenic, nickel, beryllium, cobalt, and chromium.

55604 **APTIC NO. 80554**

Aoyagi, Toyotsugu

DISPOSAL AND RECYCLING OF PLASTICS WASTE IN JAPAN. *Plastic Waste Management Inst., Tokyo (Japan), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975. p. 79-84. 3 refs. (Nov. 3-5.)*

The Japanese Plastic Waste Management Institute was set up in 1971. Its main activities are research and development of plastics waste disposal and recycling techniques, data collection of plastics waste from generation to disposal, providing correct information on plastics waste to the public, and technical and financial aids to the plastics waste recycling industry. The Institute first collected and sorted out the data and information on plastics waste, and then commenced a joint research project with domestic equipment manufacturers on plastics recycling methods such as melt-reclaim and pyrolysis and on plastics incinerators. Plastic wastes were collected separately for recycling in Funabashi City. The refuse generated by approximately 23,000 households in an apartment residential area was investigated. Three types of recycling systems were used. Physical properties of the reclaimed products were studied. The volume of plastics waste in Japan was analyzed. Pyrolysis is practical only for industrial waste unless special separation of plastics waste from other wastes is provided. The use of heat from incinerators has been popular in large Japanese cities, but environmental considerations such as effluent and smoke treatment should be taken into account.

55605 **APTIC NO. 80930**

Araya, Kozo and Masatoshi Miyahara

NATIONAL SITUATION OF THE PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku taiki osen no zenkokuteki jokyo). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:82-93, Sept. 1975 4 refs.*

An investigation of the national condition of photochemical air pollution is reported, including the oxidant warnings forecasted, the seasonal change in the frequency of oxidant warnings, reports of oxidant victims, extensive area oxidant warnings, days with high frequency of reported oxidant victims, and frequency of oxidant warnings related to days of the week. Photochemical air pollution first drew the attention of the public in July 1970 when students of Tokyo Rissho High School were victims of oxidant pollution, and when the highest oxidant concentration ever measured was reached: 0.39 ppm in Isogo, Kanagawa on July 18, 1974. The national oxidant warning standard varies from 0.15 to 0.5 ppm/hr. The oxidant forecast is announced when the oxidant concentration is likely to increase, and an oxidant warning will be announced when meteorological conditions indicate that oxidant concentrations will increase to and stay above 0.15 ppm/hr. An oxidant alarm will be announced when the oxidant concentration increases to and stays above 0.30 ppm/hr, and an oxidant emergency will be proclaimed at oxidant concentrations above 0.5 ppm. The national oxidant surveys conducted during 1970-1974 by local governments were used for this study.

55606 **APTIC NO. 80772**

Bartlit, John R. and Michael D. Williams

ENVIRONMENTAL IMPACT ASSESSMENT OF COOLING TOWERS. *Mater. Performance, 14(9):39-41, Sept. 1975. 13 refs. (Presented at Corrosion/75, Toronto, Canada, April 14-18, 1975.)*

Downstream and downwind environmental impact of cooling water towers is reported. Drift losses (escaping spray and mist droplets) generally contain high concentrations of salts and corrosion inhibitors. Their deposition near the tower may result in deleterious effects on vegetation. Droplet size strongly influences the distance at which deposition occurs, and varies from one tower to the next. The fraction which does not immediately deposit is a source of airborne particulates. Possible mitigating measures include the use of better mist eliminators and combined wet/dry cooling towers. The use of chemicals less dangerous than chromium compounds would also reduce the impact. The atmospheric effects produced by cooling towers include fog, icing, modified air dispersion of stack contaminants, and possibly modified air chemistry of stack contaminants. Plumes from cooling towers are discussed. Cooling towers may influence the behavior of contaminants from other sources.

55607 **APTIC NO. 80507**

Berge, Helmut, Erwin King, and Dieter Lorenz

WATER VAPOR IMMISSIONS IN THE AREA OF A CONVENTIONAL THERMAL POWER PLANT. *(Wasserdampfimmissionen im Bereich eines koventionellen thermischen Kraftwerks). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 117(15/16):721, 1975. (Full* *text available from VDI-Verlag GmbH, 4 Duesseldorf 1, Postfach 11 39, West Germany.)*

Meteorological, agrochemical, and air pollution studies around a conventional thermal power plant with cooling towers in the July 1972 through June 1974 period in the Koeln area in West Germany are summarized. The solar radiation losses due to the cooling towers ranged from 5 to 25% within a 500 m radius, and between 1% and 5% at distances between 500 m and 1000 m. The haze emitted by the cooling towers appears to cause a slight increase in the precipitation in the immediate vicinity, while the waste heat emission caused a slight temperature increase and a reduction of the relative humidity on the lee side. Systematic measurements of fluorine concentrations revealed frequently high concentrations in 1973, sometimes in excess of the 4 microgram/cu m limit, and substantially lower concentrations in 1974. The findings indicate a relatively high background concentration rather than a relationship between the power plant and the fluorine levels.

55608 **APTIC NO. 79840**

Bohon, R. L.

LITHOGRAPHY: LABORATORY EVALUATION OF ENVIRONMENTAL RISK. *Preprint, 3M Co., St. Paul, Minn., Environmental Engineering and Pollution Control Div., 28p., Sept. 2, 1975. 29 refs.*

Environmental contamination associated with lithographic printing operations are reviewed. Volatile solvents such as alcohols evaporate to a limited extent during plate development; while during the printing process itself, alcohols, and hydrocarbons evaporate from the dampening system and ink fountains at the press as well as form the drying oven in the case of offset printing with heat-set ink. Some plants utilize pollution control systems on the drying ovens to reduce the entry of hydrocarbon volatiles into the atmosphere, with ultimate waste disposal being either by afterburning or reuse as forklift fuel. Wash-up and cleaning solvents and ink fountains introduce hydrocarbons into the overall volatile emission load generated by the plant. Some of these compounds fall into the class of photochemically reactive compounds and hence contribute to the potential production of smog. There ar lesser amounts of other oxygenated or chlorinated solvents released to the atmosphere, most of which are classified as nonphotochemically reactive.

55609 **APTIC NO. 80412**

Bombaugh, Karl J., Aly Jefcoat, and E. C. Cavanaugh

A SYSTEMATIC APPROACH TO THE PROBLEM OF CHARACTERIZING THE EMISSION POTENTIAL OF ENERGY CONVERSION PROCESSES. *Preprint, American Institute of Chemical Engineers, New York, 43p., 1975. 7 refs. (Presented at the American Institute of Chemical Engineers National Meeting, 80th, Boston, Mass., Sept. 30, 1975.)*

A systematic approach for characterizing the pollution potential of new processes based on a knowledge of existing processes is described. The strategic use of existing processes and analytical techniques avoids delays in the implementation of a control program for new processes. An engineering analysis is used to define both the simile processes and the new process on a common base, thereby increasing the validity of the extrapolation. The approach allows for the timely definition of emission standards and controls as well as affording a task analysis reflecting job costs. A specific sample involving the analysis of refinery streams and the extrapolation of these results to a coal gasification process is presented.

55610 **APTIC NO. 81000**

Bundi, U. and H. R. Wasmer

RECYCLING: FUNDAMENTALS AND CONCEPTS. *Federal Inst. for Water Resources and Water Pollution Control, Duebendorf (Switzerland), Swiss Federal Inst. of Technology, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 28-33. (Nov. 3-5.)*

The relationship between environmental protection and recycling is discussed. Secondary environmental loading caused by the technical measures undertaken to reduce initial environmental loading is stepped up with the intensification of recycling and other environmental protection measures. The correlation between the intensity of pollution control measures and the extent of secondary loading is a first order reaction. Recycling cannot be intensified with impunity. Once the point of optimum recycling is reached, environmental loading begins to increase. Although optimum recycling often reduces environmental loading considerably, its positive effects continue to be counteracted as long as the exponential growth in the demand for resources prevails.

55611 **APTIC NO. 79938**

Czopf, Jozsef and Istvan Gyurko

EXPERIENCES FROM A SURVEY OF AIR POLLUTION SOURCES IN THE HUNGARIAN ORE AND MINERAL MINES. *(Tapasztalatok az Orszagos Erc- es Asvanybanyak legszennyezo forrasainak felmeresenel). Text in Hungarian. Banyasz. Kohasz. Lapok., Banyaszat, 108(5):317-320, May 1975. 6 refs.*

Dust emissions from diffuse and punctiform sources were studied at 5 different ore dressing and roasting plants in Hungary. The diffuse emission concentrations were found to be 5-8.14 mg/cu m in kaolin drying plants, 5.51 mg/cu m in a rock lime drying plant, 1.2 mg/cu m in a manganese ore crushing plant, and 1.8-4.1 mg/cu m in iron ore roasting. The dust concentrations from punctiform sources in these plants were 8-18 g/N cu m; 2 g/N cu m; 0.45 g/N cu m; 0.5 g/N cu m, and 3.1 g/N cu m, respectively. The findings indicate that the emissions are highest in dry ore preparation and milling operations where the emissions must be greatly limited to comply with the dust emission and concentration standards. Such emission sources require the use of two-stage dust separation using a cyclon as a first stage, and a tissue filter in a second stage.

55612 **APTIC NO. 80756**

Fitzer, Erich and Dieter Siegel

NITROGEN OXIDES EMISSION FROM INDUSTRIAL FIRING AS A FUNCTION OF THEIR OPERATING CONDITIONS. *(Stickoxid-Emission industrieller Feuerungsanlagen in Abhaengigkeit von deren Betriebsbedingungen). Text in German. Chem.-Ing.-Tech., 47(13):571, July 1975. 3 refs.*

Nitrogen oxides emissions were measured in the flue of refinery tubular furnaces and in power plant stacks by chemiluminescence analyzers to obtain relationships between the emissions and the operating conditions (type of fuel, furnace temperature, air- excess coefficient). A definite relationship between the nitrogen oxides emission and the kind of the fuel, furnace construction, air-excess coefficient, and temperature was established. The measurements revealed the dominant influence of temperature on the nitrogen oxides emissions. They can be abated by design modifications, such as burner arrangement, burner design, and other measures.

55613 **APTIC NO. 79874**

Fulkerson, W.

CADMIUM -- THE DISSIPATED ELEMENT -- REVISITED. *Oak Ridge National Lab., Oak Ridge, Tenn., Energy Div., National Science Foundation Research Applied to National Needs Environmental Aspects of Trace Contaminants Program and Atomic Energy Commission Interagency Agreement AG 389, 28p., 1975. 55 refs.*

The flow of cadmium in society is traced. Most uses of the element are highly dispersive. Consideration of the likely most important routes of return to the environment indicates that cadmium air pollution should be a serious concern only near nonferrous metal smelters, especially zinc and lead smelters.

Emissions from these operations can lead to soil contamination. Emissions from steel mills, incinerators, or coal burning power plants are probably insignificant sources of air pollution or can be reduced to insignificance by proper abatement practices. Estimates of the rat of accumulation of cadmium in the kidney and of the critical concentration (200 ppm) in the renal cortex necessary to cause rena tubular disfunction have been used to calculate the maximum permissible chronic exposure by various environmental pathways. Cigarettes are a more important source of inhaled cadmium to the general public than are most industrial emissions. Chronic cadmium exposure has caused hypertension in laboratory animals. Cadmium is also discussed as a water pollutant. (Author abstract modified)

55614 **APTIC NO. 75945**

Gilbert, D. E., F. Smith, and D. E. Wagoner

GUIDLINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM: VOLUME XIV -- SCREENING DETERMINATION OF LEAD IN GASOLINE. *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1234, Program Element 1HA327, Rept. EPA-650/4-74-005-n, 72p., Feb. 1975. 11 refs.*

NTIS: PB 244167/AS

Guidelines are presented for developing a quality assurance program for the screening determination of lead in gasoline by the Federal reference method using a portable colorimeter. The overall objectives of a quality assurance program are listed and the program components necessary to accomplish the given objectives are delineated. An operations manual is included which sets forth recommended equipment selection, presampling preparation, sampling procedures, data reduction procedures, and sample shipping procedures to insure the collection of data of high quality when contamination is detected. The Manual for Regional Supervisors is also included, which discusses the assessment of data quality, suggested performance criteria, instructions for quality control checks designed to give an indication or warning that invalid or poor quality data are being collected, and instructions for collecting and analyzing information to identify trouble. Information is presented relative to the quality assurance test method, a functional analysis to identify the important operating variables and factors, and statistical properties of and procedures for conducting an independent assessment of data quality. (Author abstract modified)

55615 **APTIC NO. 80701**

Gofmekler, V. A. and L. A. Safonova

HYGIENIC SIGNIFICANCE OF HERBICIDE PROPANIDE AS AN ATMOSPHERIC POLLUTION IN ITS USE ON RICE FIELDS. *(Gigienicheskoe znachenie gerbitsida propaunida kak zagryaznitelya atmosfernogo vozdukha pri prinenenii ego na isovykh polyakh). Text in Russian. Gigiena i Sanit., no. 9:17-19, 1975. 4 refs.*

The atmosphere of agricultural areas is polluted with propanide during the period of aerial spraying of rice fields. A sanitary protection zone is recommended between the fields under treatment and the settlements. The daily average concentration in the atmosphere is recommended to be set at a level of 0.002 mg/cu m.

55616 **APTIC NO. 80822**

Gold, Avram

CARBON BLACK ADSORBATES: A NEW CARCINOGEN AND OXYGENATED POLYCYCLES. *In: Conference Proceedings on Environmental Aspects of Chemical Use in Rubber Processing Operations, Akron, Ohio, Environmental Protection Agency, Washington, D. C., Office of Toxic Substances, B. F. Goodrich Co.-- United Rubber, Cork, Linoleum and Plastic Workers Joint Occupational Health Program Contract, Rept. EPA-560/1-75-002, p. 137-163, March 12-14, 1975. 19 refs.*

The polycyclic aromatic and polar fractions of neutral carbon black extract were analyzed. The structure of a hitherto uncharacterized carcinogen (3,4, dihydrocyclopenta(cd)pyrene) in the polycyclic aromatic fraction was characterized by partial hydrogenation and correlation of its spectroscopic and physical properties with those of the corresponding synthesized compound. Analysis of the neutral polar fraction by preparative high pressure liquid chromatography in conjunction with both high and low resolution mass spectrometry revealed a number of polycyclic ketones and an anhydride. The neutral fraction merits attention since previous investigations have demonstrated that the corresponding extract of airborne particulate matter possesses considerable carcinogenic potency. (Author abstract modified)

55617 **APTIC NO. 73378**

Handa, Takashi, Sadayoshi Matsushita, Takaki Yamamura, Masahiko Okaniwa, Shoichiro Saito, and Takashi Hashimoto

STUDIES ON AUTOMOBILE EXHAUST GAS COMPONENTS, PART 2, THE RELATION OF CARCINOGENIC HYDROCARBONS OF B(A)P TO OTHER EXHAUST GAS COMPONENTS. *(Jidosha haiki gasu seibun ni tsuiteno kenkyu, 2, hatsugansei tanka suiso B(a)P to hokano haiki gasu seibun tono kankei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 805. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2011.)*

The benzo(a)pyrene in automobile exhaust gas is analyzed to obtain the correlation with the air to fuel ratio, carbon monoxide, carbon dioxide, nitrogen oxides, and hydrocarbons emissions in the same exhaust gas. A Nissan Bluebird, model N 510 1428 cc, was used on a dynamometer. The B(a)P in the exhaust gas was collected on a glass fiber filter, extracted, and then determined by a thin layer chromatography-fluorescence technique. At both the 40 km/hr running condition and idling condition, the B(a)P level increased with increased CO emission and with decreased NOx emission. The emission level of CO and NOx at a constant running condition was regulated by adjusting the combustion condition of the engine. The B(a)P emission rapidly decreased when the CO level was less than 6% at idling condition, and rapidly increased when the NOx level was less than 45 ppm at idling condition. The B(a)P emission per unit gasoline consumption at these critical CO and NOx levels was 3 micrograms/l gasoline and 2 micrograms/l gasoline respectively. The B(a)P level at idling condition rapidly increased when the air fuel ratio was less than 12. Therefore the B(a)P emission level is found higher under incomplete fuel combustion.

55618 **APTIC NO. 80786**

Hoshika, Yasuyuki, Satoshi Kadowaki, Ichiro Kozima, Kazumi Koike, and Kenji Yoshimoto

DETERMINATION OF THE SULFUR COMPOUNDS IN THE EXHAUST GAS FROM A CELLOPHANE FACTORY BY GAS CHROMATOGRAPHY. *(Gas Chromatography ni yoru cellophan seizo kojo haikigasu cho no ioukagobutsu no kenshutsu). Text in Japanese. Yukagaku (J. Japan Oil Chem. Soc.), 24(10):685-686, 1975. 9 refs.*

Exhaust gas from the exhaust tower of a 450,000 t/year cellophane manufacturer was analyzed for its sulfur compounds using gas chromatography with flame photometric detector. The exhaust gas was sampled for 5 min using a 1 l sampling bottle. The gas was immediately transferred to a liquid oxygen trap. The GC column was a 3 mm by 3 m glass tube packed with 25% TCEP or 25% TCP on Shimalite (AW, DMCS) (60/80 mesh) with nitrogen at 50 ml/min as carrier gas. The carbonyl sulfide, hydrogen sulfide and carbon disulfide contents in the exhaust gas were found to be 8-14 ng/0.01 l, 26-48 ng/0.01 l, and 720 to more than 1000 ng/ 0.01 l, respectively. Irradiation of the sample gas with natural sunlight (0.6 cal/sq cm-min) resulted in the increase of COS and CS2 concentrations, but that of H2S was not affected.

55619 **APTIC NO. 80582**

Iammartino, Nicholas R.

A SULFUR-IN-GASOLINE SCARE? *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 171-173, June 1975. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.) (Presented in Chemical Engineering, 1974:74, 76, 78, Dec. 9, 1974.)*

GPO

The problem of reducing sulfate emissions from automobiles equipped with catalytic converters and operating on sulfur-containing gasoline is discussed, with particular emphasis on the economic impact associated with various controls. Converter-equipped vehicles oxidize up to 50% of the engine s sulfur dioxide to sulfur trioxide, and the latter combines with water vapor in the combustion off gas to produce hydrated sulfuric acid aerosol (sulfate) discharges. Possible alternatives for the control of sulfate emissions include further refining of gasoline to remove sulfur and the use of sulfate traps on automobiles. The addition of hydrodesulfurization for cracker feedstock and for straight-run gasoline at an industrywide investment of $2 billion in 1974 dollars is estimated to cost 0.67 cents/gal of gasoline for a typical 100,000 barrel/day refinery. Desulfurizing cracked gasoline instead of feedstock is estimated to boost processing costs to 1.06 cents/gal for a 100,000 barrel/day refinery. Sulfate trap technology is lagging, and estimated trap durability is expected to be only between 10,000 and 15,000 mi. The modification of catalytic converters to preclude sulfate emissions does not appear to be likely.

55620 **APTIC NO. 73437**

Ishimaru, A., M. Ogura, K. Aihara, S. Hashimoto, T. Takano, K. Hirano, M. Kaneko, and S. Nishiyama

INVESTIGATION ON COMPOSITION AND INFLUENCE OF FLUE DUST, PART I, COMPOSITION OF FLUE DUST CLASSIFIED BY BUSINESSES AND FACILITIES. *(Endobaijin no seibun sosei to eikyo chosa, (1), gyoshu oyobi shisetsu betsu endo baijin no seibun sosei). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.) no. 6:50, Feb. 1975.*

Harmful compounds including both heavvy metals and nonmetals in soot dusts emitted from facilities which use higher sulfur containing fuels were analyzed. The correlation between the pH of soot dusts and the sulfur contents in fuels was high for those facilities using heavy oils. A few cases were observed in which the pH of soot dust was as low as 0.6. The soot dust with ph below 1.8 contained 6 to 32% sulfuric acid calculated by alkaline consumption. Plant damage was observed near the areas of those facilities emitting highly acidic dusts. The acidic dusts strengthened the dissolution of heavy metals into the dusts. The pH measurement of soot dusts could be effective as a simple method for the pollution monitoring of the facilities.

55621 **APTIC NO. 73314**

Iwatani, T.

PRESENT STATUS OF AND FUTURE PLANS FOR POLLUTION CONTROL MEASURES. *(Kogai boshi taisaku no genjo to kongo no keikaku). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Control, Japan), 28(90):30-31, Jan. 1975.*

Atmospheric control measures are described for Kushiro factory, Hokkaido, Japan, where corrugated cardboard has been manufactured since 1959. The production capacity of this plant is 2000 tons/day. Types of pollution discussed in the article include particulates, sulfur dioxide, nitrogen oxides, and malodors. In December 1973, the company and Kushiro City concluded a pollution control agreement, whereby severe regulatory conditions on air, water, odor, and noise pollution were imposed upon the factory. The factory has been in close touch with the community in strengthening pollution control measures, installing better pollution control equipment, and improving environmental conditions

55622 **APTIC NO. 80994**

Kirsch, H.

COMPOSITION OF DUST IN THE WASTE GASES OF INCINERATION PLANTS. *VGB Technische Vereinigung der Grosskraftwerksbetreiber e. V., Essen (West Germany), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 185-18 (Nov. 3-5.)*

The composition of dust in the waste gases of seven incineration plants was analyzed. Thirty-five chemical elements were analyzed quantitatively. Apart from the normal elements, silicon, aluminum, calcium, potassium, sodium, iron, and sulfur, the samples contained lead, zinc, and chlorine with concentrations above 2% by weight. The average content of barium, copper, fluorine, and tin was above 500 ppm. There were huge differences in chemical composition from one plant to another. The concentration of mercury varied within the samples from 1-800 ppm.

55623 **APTIC NO. 79846**

Lindberg, S. E., A. W. Andren, R. J. Raridon, and W. Fulkerson

MASS BALANCE OF TRACE ELEMENTS IN WALKER BRANCH WATERSHED - THE RELATION TO COAL FIRED STEAM PLANTS. *Oak Ridge National Lab., Tenn., Environmental Sciences Div. and Computer Science Div., 30p., 1975. 23 refs. (Presented at the Research Triangle Conference on Heavy Metals in the Environment, Annual, 3rd, Chapel Hill, N. C., May 15-16, 1975.)*

A mass balance study of trace element flows at the Tennessee Valley Authority s Allen Steam Plant at Memphis, Tennessee was performed. Most of the released mercury, some of the selenium, and probably most of the chlorine and bromine released were discharged to the atmosphere as gases. The elements arsenic, cadmium, copper, gallium, molybdenum, lead, antimony, selenium, and zinc were concentrated in fly ash discharged through the stack rather than in the slag collected by the precipitator. Wet and dry deposition studies around the Walker Branch Watershed which is within 20 km of three steam plants in the area revealed that the watershed efficiently retains 97-98% of the atmospheric lead input, 94-95% of the cadmium input, and 82-84% of the copper input. Chromium, manganese, zinc, and mercury were less well retained, with their respective percentages being 69, 57, 73, and 69%. (Author abstract modified)

55624 **APTIC NO. 80558**

Liu, Benjamin Y. H. and K. W. Lee

AN AEROSOL GENERATOR OF HIGH STABILITY. *Am. Ind. Hyg. Assoc. J., 36(12):861-865, Dec. 1975. 8 refs.*

The use of a syringe pump to provide a constant liquid flow to an atomizer to obtain an aerosol generator of high stability is reported. The syringe pump atomizer was also used with a vaporizer and condenser to produce monodisperse aerosols by vaporization and condensation. To monitor the output of the aerosol generator an electrical aerosol detector was used. The detector consisted of an aerosol charger, which placed a unipolar charge on the aerosol particles, and a charged particle detector, which collected the particles by filtration and measured the total current with an electrometer. The size distribution of the condensation generator was measured with an optical particle counter and the electrical aerosol analyzer in their respective ranges. The median particle size of the aerosol varied from 0.032 micron with a dioctyl phthalate (DOP) concentration of 0.0048% to 1.3 micron for 100% DOP. The measured geometrical standard deviation of the aerosol was between 1.2 for the 100% DOP and about 1.4 for the 0.0048% DOP. (Author abstract modified)

55625 **APTIC NO. 81005**

Luchsinger, P.

A DANISH CENTRAL PROCESSING FACILITY FOR INDUSTRIAL AND OTHER PROBLEM WASTE-PLANNING, DESIGN AND START-UP EXPERIENCE OF THE NYBORG PLANT. *VON ROLL Ltd., Zurich (Switzerland), Engineering and Environmental Div., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 608-615. (Nov. 3-5.)*

The composition of flue gas at a Danish central processing facility for waste burning was analyzed. Measurements during performance tests showed a pure dust content averaging 30 mg/N cu m flue gas (7% carbon dioxide dry). The crude gas dust content measured at the electrostatic precipitator inlet amounted to 1-2 g/N cu m flue gas. The water content of the flue gases was relatively low. Because of the low pure dust content and an outlet temperature of approximately 280 C, absolutely no flue gas plume was visible even in humid weather. The installation has 2 combustion plants: one large-scale for non-toxic materials, another medium-size for chlorinated solvents. Economic aspects of the system are described.

55626 **APTIC NO. 80431**

Magida, Arthur J.

ENVIRONMENT REPORT/EPA STUDY MAY BRING REPRIEVE FOR CATALYTIC CONVERTER. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 205-211, June 1975. (Prepared for the Subcommittee on the Environmnet and the Atmosphere of the Committee on Science and Technology.) (Presented in National Journal Reports, April 12, 1975.)*

GPO

A follow-up study on the generation of sulfuric acid (sulfate) emissions from automobiles equipped with catalytic converters is reviewed which disputes information cited by the Environmental Protection Agency s Administrator that was used to justify delaying tougher clean air standards. The follow-up study, also conducted by the EPA, reveals that 1975 production cars emit 0.015 g/mi of sulfuric acid as opposed to the original EPA estimate of 0.03 g/mi. Using the new emission figure, the estimated exposure to sulfuric acid mists emanating from automobiles is estimated to be at least one-third less than the original estimate. The original estimates were based on a 10-lane hypothetical highway model, whereas the follow-up estimates were based on readings made on actual highways. Sulfuric acid readings during the follow-up study ranged from 40-90% less than those predicted originally.

55627 **APTIC NO. 81022**

Masahiro, Ochiai and Hanya Takahisa

ALPHA-AND GAMMA-BHC IN TOKYO RAINWATER (DECEMBER 1968 TO NOVEMBER 1969). *Environ. Pollut., 9(4):283-288, Dec. 1975. 6 refs.*

Environmental pollution caused by BHC, an insecticide formerly used in large quantities in Japan, was investigated. The concentration of alpha-BHC and gamma-BHC in rainwater collected in Tokyo between Dec. 1968 and Nov. 1969 was in the range of 45 to 830 pp 10 to the 12th power and 29 to 398 pp 10 to the 12th power, respectively. The monthly average concentration of BHC in summer, when more of the insecticide was used, was higher than that in other seasons. (Author abstract modified)

55628 **APTIC NO. 73419**

Masui, Yoshio, Yoshio Saiki, Koji Nagami, and Saburo Sugano

ENVIRONMENT SURVEY ON THE AUTOMOBILE EMISSION GAS AT THE MAIN INTERSECTIONS IN KANAGAWA PREFECTURE. *(Kenka no shuyo kosaten to ni okeru jidosha haishutsu gas kankyo chosa). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:40, Feb. 1975.*

The carbon monoxide and nitrogen oxides levels at various intersections in Kanagawa Prefecture were measured, from which the diffusion of automobile exhaust gases was deduced. The CO level was much lower than the CO environmental standard, but the NOx level exceeded its environmental standard. No proportional relation of traffic number with CO level at intersections was observed, but the CO level was affected by the distance between the measurement location and intersection and by the geometrical conditions at the measurement location, such as thee presence of large buildings nearby.

55629 **APTIC NO. 80417**

Matson, Thomas K. and Doss H. White, Jr.

THE RESERVE BASE OF COAL FOR UNDERGROUND MINING IN THE WESTERN UNITED STATES. *Bureau Mines Information Circ., no. 8678, 241p., 1975. 47 refs.*

Data on the coal reserve base in the western United States are presented for coalbed amenable to extraction by underground mining methods. Tonnages are compiled by state, county, coalbed, and rank and are allotted to sulfur categories by statistical apportionment. The coal reserve base in those states west of the Mississippi River is estimated to be approximately 131 billion tons. About 30.8 billion tons are bituminous coal, 100.2 tons are subbituminous coal, and 126.4 million tons are anthracite. (Author abstract modified)

55630 **APTIC NO. 80929**

Matsumura, Tetsuo

SUMMARY OF AIR POLLUTANT SOURCE INVESTIGATION. *(Taiki osen busshitsu hasseigen chosa no gaiyo). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:30-32, Sept. 1975. 4 refs.*

An investigation of the sources of nitrogen oxides (NOx), hydrocarbon (HC), carbon monoxide (CO), and dust pollution by the Air Protection Planning Office of the Environmental Protection Agency is summarized. The emission factors of the various sources of air pollutants were calculated. They will be used as a baseline for pollution prevention planning, total emissions restriction, environmental assessment, and exhaust emission standards. The sources of air pollutants in the areas of the Tokyo Bay and Osaka Bay were investigated during 1972 to 1975. An analytical method for data obtained from on-site measurement of the air pollutants is discussed, which uses the following units for emission factors: liquid fuel kg/gal, solid fuel kg/t, gaseous fuel kg/N cu m, and exhaust volume of pollutants kg/10 to the 8th power kl.

55631 **APTIC NO. 80923**

Matsushima, Ryozo

TREND ON THE NITROGEN OXIDES CONTROL AND ITS COMING PROBLEMS IN TOKYO. *(Rokyoto ni okeru chisso sankabutsu kisei no hoko to mondaiten). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), vol. 1975:66-70, Nov. 1975.*

Nitrogen oxides pollution control is an urgent issue in Tokyo. The 1974 Plan to Protect Citizens from Environmental Pollution, was proposed in April 1974, to curtail nitrogen oxides concentrations in the air. The NOx contamination in Tokyo, using a statistical report which indicates total yearly emissions of NOx, was approximately 96,000 ton in 1972 (70% from autos, 30% from stationary sources). The NOx reduction plan of 1974 has an intermediate objective to achieve 80% days/year with a daily average NOx concentration below 0.02 ppm/hr by 1977, and a final objective to achieve the environmental standard for NOx by 1980. The result has been various regulations for automotive exhaust emissions and stationary sources in addition to the existing regulations. Present problems of NOx control and the future direction of the control policy are discussed.

55632 **APTIC NO. 80405**

Mularz, Edward J., Jerrold D. Wear, and Peter W. Verbulecz

POLLUTION EMISSIONS FROM SINGLE SWIRL-CAN COMBUSTOR MODULES AT PARAMETRIC TEST CONDITIONS. *National Aeronautics and Space Administration Lewis Research Center and Army Air Mobility Research and Development Lab., Cleveland, Ohio, Rept. NASA TM X-3167, 35p., Jan. 1975. 11 refs.*

NTIS: N-75-15200

Tests were conducted to evaluate a number of swirl can combustor module designs for oxides of nitrogen emissions at simulated full power gas turbine operation. Exhaust pollutants were measured from single swirl can modules burning Jet A fuel and operating over a pressure range of 69 to 276 newtons/sq cm, a fuel/air ratio range of 0.01 to 0.04, at an inlet air temperature of 733 K, and at a constant reference velocity of 23.3 m/sec. Eleven swirl can models exhibited oxides of nitrogen emission levels lower than those from conventional gas turbine combustors. Also, higher pressure drop module designs may further reduce these oxides of nitrogen concentrations based on the trends of the test results. The oxides of nitrogen emissions varied with a power of the normalized combustor pressure. The exponent had a different value for each module design, varying from 0.27 to 0.74. The emissions from a single swirl can module may not be representative of a large array installed in a complete combustor.

55633 **APTIC NO. 73433**

Nagami, K., N. Yamaki, K. Imagami, K. Hishida, T. Shirasawa, Y. Odate, E. Yoneyama, M. Nagata, S. Ishida, I. Kobayashi, K. Kato, and K. Tachibana

EMISSION OF NITROGEN OXIDES AND HYDROCARBONS IN INDUSTRIAL STATIONARY INCINERATORS. *(Kogyo yo kotei nensho shisetsu ni okeru chiso sankabutsu, tankasuiso no hashitsu). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.) no. 6:39, Feb. 1975.*

Emission coefficients of nitrogen oxides and hydrocarbons for several industrial combustion facilities, such as power stations, glass fusion furnaces, metal heating furnaces, coke furnaces, cement calcination furnaces, cupola, and inversion furnaces, are determined from considerations of NOx and hydrocarbon concentrations, flue gas emission rate, fuel consumption rate, fuel composition, type of burner, and flame temperature. The emission coefficients varied with the individual facility, and the emission coefficient of NOx agreed with its theoretical emission trend. Agreement with the Woolrich equation was also found.

55634 **APTIC NO. 80401**

Naugle, Dennis F. and Steven R. Nelson

USAF AIRCRAFT POLLUTION EMISSION FACTORS AND LANDING AND TAKEOFF (LTO) CYCLES. *Air Force Weapons Lab., Kirtland AFB, N. Mex., Proj. 21033A13, Program Element 63723F, Rept. AFWL-TR-74-303, 48p., Feb. 1975. 4 refs.*

NTIS, DDC: AD/A-006 239

The list of measured pollution emission factors specific to each major Air Force aircraft engine type is updated. The categories of pollutants considered are carbon monoxide, unburned hydrocarbons, oxides of nitrogen, and total particulates. Results of research to define landing and takeoff cycle times for nine operational modes for each aircraft type are presented. The times were determined by actual measurement and by interviews with pilots. (Author abstract modified)

55635 **APTIC NO. 79952**

Nishikawa, E.

EMISSION AMOUNT OF NITROGEN OXIDES FROM POWER PLANT BOILERS AND ITS CONTROL METHOD. *(Hatsudensho boira kara no chisso sankabutsu haishutsu ryo to sono boshi taisaku). Text in Japanese. Denryoku Sangyo to Kogai (Power Ind. Pollut.), no. 6:46-53, Sept. 1975. 22 refs.*

Statistical data on the quantity of nitrogen oxides emitted from power plant boilers, compiled by the U. S. National Air Pollution Control Administration, the Japan Electric Association, and the Environment Agency of Japan are reviewed. The estimated total NOx emission quantity from all sources was 1,160,000 ton in 1976 and that from power plant boilers was 487,000 ton, which represented 43%. The second highest NOx emission source was automobiles with 27% of the total. The rapid increase in fuel consumption in recent years also indicates a rapid increase in NOx emission. NOx emissio control techniques that reduce NOx formation (low excessive air ratio combustion, two-stage combustion, exhaust gas recirculation, boiler modification), and denitrification methods (reduction of NOx absorption of NOx, adsorption of NOx) are discussed, with a review of the NOx formation mechanism. Future trends in NOx emission control techniques are also discussed.

55636 **APTIC NO. 80767**

Ohashi, Hideo and Akinori Ohta

AUTOMOBILE EXHAUST DIFFUSION IN TUNNEL BY DISTURBANCE ACTION. *(Jidosha no kakuran sayo ni yoru tonneru naino haiki gasu kakusan). Text in Japanese. Preprint, the Japan Society of Mechanical Engineers, Tokyo, p. 327-330, 1975. 2 refs. (Presented at the Japan Society of Mechanical Engineers, Lecture Meeting, 858th, Hiroshima, Aug. 20-21, 1975.)*

Exhaust gas diffusion in a tunnel was studied by using a 90 mm (i.d.) by 2 m pipe. Bullet type bodies (light truck equivalent) hung on an endless wire rope were used to simulate automobiles. The wire rope was driven by a driving pulley. Carbon dioxide trace gas was kept in a closed box connected to one end of the pipe. Gas in the pipe was sampled from sampling holes on the pipe at 200 mm intervals. The bullet type bodies were moved at 59 cm/s, and 200 ml of sample gas was taken with a syringe when the concentration distribution in the pipe became constant. The diffusion coefficients with and without the moving bodies were obtained from concentration slopes by least square method using the concentration distributions at 6 points in the pipe. Results revealed that for up to 1870 trucks/hr, the diffusion coefficient increased with increasing number of trucks. The diffusion coefficient became almost constant at higher numbers of trucks.

55637 **APTIC NO. 73392**

Onodera, Takashi and Kohki Hosaka

AUTOMOTIVE FUEL FOR POLLUTION CONTROL. *(Kogai taisaku kara mita jidosha nenryo). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(3):185-191, 1975. 32 refs.*

The following regulations were issued during July 1970 and Feb. 1975 aiming at reducing lead pollution from automobile gasoline: lead additive concentration not to exceed 1.1 ml/gal; octane number of premium gasoline not to exceed 98 and that of regular gasoline not to exceed 91; to enforce the production of non-leaded regular gasoline. Non-lead gasoline is preferred for automobiles with catalytic converters, since lead retards the catalytic activities. Aldehydes as an irritant usually exist at low concentration in automotive exhaust but their contribution to photochemical reactions is far from negligible. Aromatic aldehydes required more serious attention as they are strong eye irritants. Nitrogen oxides concentration in exhaust depends on air/fuel ratio and moisture content in fuel as well as the octane number. The effect of aromatic hydrocarbons in fuel on NOx concentration in fuel is negligible. Alcohols such as methanol as engine fuel reduce hydrocarbon and NOx concentrations in the exhaust but increase formaldehyde concentration markedly.

55638 **APTIC NO. 80840**

Pattison, John N.

AUTOMOTIVE FUEL ECONOMY AND ENVIRONMENTAL CONTROL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., East-Central Section, 24p., 1975. 17 refs. (Presented at the Air Pollution Control Association East Central Section Meeting, Dayton, Ohio, Sept. 18, 1975.)*

The effect of present and future automotive emission control methods on fuel economy is discussed. Fuel economy of controlled and uncontrolled cars is compared. There are definite advantages to not controlling oxides of nitrogen from cars, lower urban oxidant levels will result. Ambient air monitoring data show that oxides of nitrogen control in most cases is detrimental to environmental quality and at the same time is responsible for a large portion of the increased cost of controls and increased fuel consumption. (Author abstract modified)

55639 **APTIC NO. 80864**

Radtke, R., D. Kapellen, A. Frank, and N. Beachley

SIMULATION OF AUTOMOBILE MILEAGE AND EMISSIONS BY USE OF DYNAMIC MODELS AND REAL COMPONENT DATA. *Preprint, Wisconsin Univ., Madison and Shell Development Co., Wood River, Ill., 8p., 1975. 5 refs. (Presented at the Intersociety Energy Conversion and Engineering Conference, 10th, Aug. 18-22, 1975.)*

A computer simulation program for calculating continuously the instantaneous fuel consumption and exhaust emissions of passenger cars is described. The program includes the modeling of dynamic interactions within the powerplant and chassis, making it possible to investigate transient effects that are masked with simulation models based on the assumption of operation at a series of steady-state conditions. A real-time hybrid computer version in combination with a driver compartment simulator allows drivability and other human factors to be evaluated and is particularly useful in the study of advanced and unorthodox concepts. Predicted fuel consumption values compare closely with experimental data for all types of driving cycles; however, emissions values for carbon monoxide, hydrocarbons, and nitrogen oxides are appreciably in error, indicating the need for dynamic emissions data. (Author summary modified)

55640 **APTIC NO. 80751**

Rikhter, L. A. and V. I. Kormilitsin

ANALYSIS OF POWER PLANT FLUE GAS EVACUATION SYSTEMS. *(Analiz skhem evakuatsii dymovykh gazov TETs). Text in Russian. Teploenergetika, no. 9:23-28, 1975. 10 refs.*

A technical-economic analysis of the connection of steam generators and peak-shaving boilers in power plants to flue gas stacks is presented. The volume of the flue gases discharged is substantially higher during the winter period than in summer, which causes corresponding changes in the flue gas speed through the stack within a wide range. These changes must be duly considered when selecting the aerodynamic characteristics of the stacks. Peak-shaving boilers increase the flue gas temperature and consequently the stack draft as compared with base-load boilers. Flue gas stacks composed of several shafts were advantageous for thermal power plants.

55641 **APTIC NO. 80388**

Roffman, Haia and Amiram Roffman

COAL MINING METHODS AND RELATED ENVIRONMENTAL EFFECTS ON LAND, AIR AND WATER. *Preprint, Inst. of Environmental Sciences, 4p., 1975. 8 refs. (Presented at the Institute of Environmental Sciences Energy and the Environment, Annual Meeting, 21st, Anaheim, Calif., April 13-16, 1975.)*

The impact of coal mining methods on air quality is discussed. The health of mining operators is provided by control of buildup of gaseous concentrations by the use of well designed ventilation systems and by control of dust by employment of wetting agents and various types of foams. Both underground and surface mining are considered as near ground emission sources (in the case of underground mining, releases of pollutants are made through exhaust ducts). In both cases the impact on air quality is very small when compared to that of coal fired electric power plants. It is confined to a small area due to its nature, a nearground release. The transport of coal from the mining area poses the same type of problems for both types of mining operations.

55642 **APTIC NO. 80529**

Ryan, J. A. and N. R. Mukherjee

SOURCES OF STRATOSPHERIC GASEOUS CHLORINE. *Rev. Geophys. Space Physics, 13(5):650-658, Nov. 1975. 93 refs.*

Present and anticipated sources of atmospheric gaseous chlorine (GCl) are described, and the stratospheric source strength is estimated. The stratospheric sources are transport of tropospheric GCl across the tropopause, direct stratospheric introduction by major volcanic eruptions, and anthropogenic emissions in the stratosphere. The mean source strengths are estimated to be, respectively 4 times 10 to the 10th power, 1 times 10 to the 11th power, and 5 times 10 to the 9th power g GCl/yr. The last figure represents a projection of anthropogenic emissions to include 50 space shuttle flights/yr. Whereas the first source introduces GCl only at the base of the stratosphere, the other two can supply GCl directly to altitudes up to 50 km. The dominant source (volcanic) is highly variable; as much as 3 times 10 to the 13th power g GCl can enter the stratosphere from a single eruption. (Author abstract modified)

55643 **APTIC NO. 80404**

Schultz, Donald F.

EXHAUST EMISSIONS OF A DOUBLE ANNULAR COMBUSTOR -- PARAMETRIC STUDY (TECHNICAL MEMORANDUM). *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Rept. NASA TM X-3164, 44p., Feb. 1975. 11 refs.*

NTIS: N75-16645

A parametric exhaust emissions study was performed with a full scale double annular ram induction combustor designed for Mach 3.0 cruise operation. Emissions of oxides of nitrogen, carbon monoxide, unburned hydrocarbons, and smoke were measured as a function of combustor operating variables including reference velocity, inlet total pressure, temperature, and exit average temperature. An empirical equation is provided relating oxides of nitrogen emissions to inlet temperature and pressure, reference velocity, and exit average temperature. Test conditions ranged from 20 to 62 newtons/sq cm inlet total pressure, 585 to 895 K inlet temperature, 24 to 48 m/sec reference velocity, and 815 to 1475 K exit average temperature. Emissions data were also obtained at a simulated engine idle point of 41 newtons/sq cm inlet total pressure, 480 K inlet temperature, 31 m/sec reference velocity, and a fuel/air ratio range of 0.008 to 0.012. Smoke numbers were very low and reached a minimum of four at 32 m/sec reference velocity, 62 newton/sq cm inlet pressure, 590 K inlet air temperature, and 1475 K exit temperature. A maximum combustion efficiency of 98.1% was obtained by radial fuel staging at a simulated engine idle condition for a high pressure ratio fan engine operating at a 32 m/sec reference velocity, 41 newtons/sq cm inlet pressure, 478 K inlet air temperature, and a fuel/air ratio of 0.012. This resulted from a reduction in carbon monoxide and unburned hydrocarbons which increased combustor efficiency by approximately 1% above the 97% value obtained without staging. (Author abstract modified)

55644 **APTIC NO. 73554**

Sebastian, Frank P.

SLUDGE INCINERATION SOLVES A SLUDGE DISPOSAL DILEMMA. *Preprint, American Inst. of Chemical Engineers, New York, 28p., 1975. 8 refs. (Presented at the American Institute of Chemical Engineers, 1975 Conference, Complete Water Reuse: Waters Interface with Energy, Air and Solids, 2nd National Conference Chicago, Ill., May 4-8, 1975.)*

Sludge incineration is discussed in terms of its advantages over other disposal alternatives and its impact on air quality. Emissions of hydrocarbons, carbon monoxide, and nitrogen oxides from sludge incineration activities are insignificant in comparison to other sources and amount to 0.19, 0.57, and 0.29 g/person/day. Particulate emissions are well within current air quality standards. Advantages of sludge incineration over other methods of disposal include the decomposition of polychlorinated biphenyls and pesticides, the production of a quasi-fertilizer ash product, the recovery of by-products such as lime, and energy reclamation involving heat recovery in closed loop systems. Analyses of incineration ash samples generally show a higher concentration of heavy metals when compared to sludge samples, particularly for the metal lead.

55645 **APTIC NO. 80762**

Sekiuchi, T., M. Kaneko, K. Sudo, and T. Goto

STUDIES ON THE ODOR OF THE STOCKBREEDING HOUSE. *(Chikusha no shuki ni kansuru kenkyu (Dai 1 po)). Text in Japanese. Miyagi Ken Kogai Gijutsu Senta Hokoku (Miyagi Prfect. Pollut. Contr. Tech Center Rep.), no. 3:36-47, 1975. 3 refs.*

Ammonia and triethylamine concentrations in and around chicken breeding houses were analyzed. Filter paper (no. 6, 11 cm diameter) was immersed in 8% oxalic acid solution for 5 min. It was dried at 60 C and cooled in a desiccator. The filter paper was fixed in the holder of a Shimazu AMC-1 model amine- ammonia collector and sampling was carried out by suction for 5 min at 10 l/min. The filter paper was then removed from the holder and immersed in 20 ml water at 60 C for 20 min with occasional stirring. The solution was taken to a volumetric flask and diluted to 50 ml. The sample solution (10 ml) was added and diluted to 5 ml of phenol-sodium nitroprusside solution. Sodium hypochlorite solution (5 ml) was added to the solution, followed by standing at 25-30 C for 1 hr. The absorbancy of the solution was measured near 640 nm and the concentration of ammonia was obtained from a previously prepared calibration curve. Gas chromatography was used for the determination of triethylamine by concentrating the solution obtained by washing the oxalic acid-impregnated filter paper. The ammonia concentrations in chicken breeding houses ranged from less than 0.1 ppm to 6.4 ppm, while the triethylamine concentrations ranged from less than 0.0002 ppm to 0.0052 ppm.

55646 **APTIC NO. 80982**

Shabad, L. M.

CIRCULATION OF CARCINOGENIC SUBSTANCES IN THE ENVIRONMENT: FROM LABORATORY EXPERIMENTS TO FIELD INVESTIGATIONS. *GANN Monogr. Cancer Res., no. 17:179-187, 1975. 31 refs.*

Investigations on the carcinogenic pollution of the human environment are summarized. At least one of the causes of lung cancer is the inhalation of polluted atmospheric air. Benzo(3-4)pyrene (BP) is found in the air of London and Los Angeles. The main sources of the polycyclic aromatic hydrocarbons (PAH) in air are heating systems, industrial plants (especially coke chemical and oil refining factories) and exhaust from internal combustion engines. There is a wide distribution of PAH and especially of BP far from the sources of their exhaust. An increased level of these substances was found at 15-25 km from big coke chemical and oil refining factories in the USSR. The circulation and fate of these substances is noted: from air to soil and water, then to vegetation, then into fodder and (directly or indirectly) to food. (Author abstract modified)

55647 **APTIC NO. 80380**

Shisler, R. A., J. H. Tuttle, and A. M. Mellor

EMISSIONS FROM AND WITHIN A FILM-COOLED COMBUSTOR. *Preprint, Purdue Univ., Lafayette, Ind., Combustion Lab., 26p., 1975 (?). 15 refs.*

Measurements of carbon monoxide, hydrocarbons, and nitric oxide area averaged net emissions were performed for different axial and radial positions within an Allison T-56 film-cooled gas turbine combustor. Measurements for both liquid and vapor propane fuel revealed little difference in pollutant characteristics associated with each fuel phase. A comparison of the data for propane with data reported for measurements made on engines burning aviation fuel revealed that CO and hydrocarbon emissions were higher for propane at design operating conditions. At low speed ground idle, the opposite was true. The NO data for propane were consistently lower. The results of internal measurements within the film-cooled T-56 combustor operating near its design point were generally consistent with a physical model of spray combustion developed for a penetration jet-cooled J-33 liner. Exhaust plant measurements confirmed that near the engine idling point injector performance largely determines NO emissions. (Author summary modified)

55648 **APTIC NO. 80815**

Sinha, Kumares C.

AIR POLLUTION CONSIDERATIONS IN TRAFFIC PLANNING AND ENGINEERING. *Purdue Univ., West Lafayette, Ind., Road School Proc. Annu., 61st, West Lafayette, Ind., 1975, p. 159-172. 8 refs. (March 11-13.)*

A brief discussion is presented on the overall considerations of air pollution as they relate to traffic planning and engineering. Air pollution associated with automobile transportation consists mainly of carbon monoxide, nitrogen oxides, hydrocarbons, lead compounds, suspended particulates, and some sulfur oxides. Where the effective control of automobile air pollution immediately at the source is not technologically or economically feasible, the emphasis should be placed on an improved traffic management program or better traffic planning and design. The level of air pollution in an area due to the automobile and its cumulative effects is dependent upon various factors. A parking facility is an indirect pollution source attracting mobile vehicle sources, thereby resulting in high levels of localized emissions. Long-range planning actions involving land use will ensure desirable allocation of urban activities. Several short term and intermediate range traffic engineering related actions are also possible in urban areas to improve the air quality. A great reduction in carbon monoxide level in the air of urban areas can be achieved if the flow of traffic in street networks can be made more smooth without excessive delay and congestion. Generally, actions associated with effective regulation are more likely to reduce traffic than changes in urban transportation pricing policy or other measures. Results of actual traffic management schemes are presented. The objectives of improved air quality and improved level of traffic services in urban areas are not mutually exclusive.

55649 **APTIC NO. 80750**

Sprunck, Hartmut, Erich Bibus, and Juergen Henkel

USED TIRES - WASTE OR RAW MATERIAL? *(Altreifen - Muell oder Rohstoff)? Text in German. Chem.-Tech., 4(8):297-299, 1975. 5 refs.*

A used tire incinerator with 0.9 ton/hr capacity at Gummi-Mayer in West Germany is described. As indicated by the low carbon content in the ash .02% by weight, practically complete incineration is achieved. The flue gases are burnt out in an afterburning chamber to be admitted into a waste heat boiler at about 1000 C for steam generation. Soot deposits in the waste heat boiler are stripped by steam blowing every 4 hr. After the waste heat boiler, the flue gases are cooled to 270-330 C, cleaned by means of a dry tissue filter, and discharged into the atmosphere. The dust retained on the filter contains 60-63% zinc. Emission measurements revealed a total carbon emission of 5 mg/N cu m at 11% oxygen content, and an average sulfur dioxide concentration of 160 mg/N cu m. No carbon monoxide or extra light fuel oil were found in the flue gases. The findings indicated that the emission level is well below the acceptable limit. The used tire incinerator is operated economically.

55650 **APTIC NO. 80823**

Taggart, Robert H., Jr.

SHREDDED TIRES AS AN AUXILIARY FUEL. *In: Conference Proceedings on Environmental Aspects of Chemical Use in Rubber Processing Operations, Akron, Ohio, Environmental Protection Agency, Washington, D. C., Office of Toxic Substances, Rept. EPA-560/1-75-002, p. 361-370, March 12-14, 1975.*

The feasibility of burning a mixture of 10% shredded rubber tires and 90% coal by weight in an industrial stoker-fired boiler was investigated. Stack emissions of particulates and sulfur dioxide were in compliance with Michigan state codes. Sulfur dioxide emissions actually decreased as a result of burning the mixed fuel. The average particulate increase over coal-firing was 62.4%, 15% of which was zinc oxide. Computer diffusion modeling showed that maximum ground level concentrations of zinc oxide over 8-hour periods were far below the 8-hour concentration of 5000 micrograms/cu m established by the American Conference of Governmental Industrial Hygienists in 1974. The rubber-coal fuel mixture represents a yearly savings of approximately 6% of the powerhouse fuel costs, not including capitalization costs on the rubber handling equipment. (Author abstract modified)

55651 **APTIC NO. 80925**

Terabe, Motoji

ANTI-CORROSION AND ENVIRONMENTAL POLLUTION CONTROL MEASURES. *(Boshoku to kogai taisaku). Text in Japanese. PPM (Japan), 6(11):18-28, 1975. 6 refs.*

Painting processes for prevention of corrosion may discharge environmental pollutants such as dust, mist, malodor, waste water, and noise. Prepainting preparation processes discharge acid waste water containing heavy metals, and galvanizing plating processes exhaust gases caused by flux. Control of these environmental pollutants is discussed primarily from the viewpoint of water and air pollution. Legal regulations for waste water, waste water treatments which includes physical and chemical treatments, and treatments for organic and inorganic waste water are discussed. Regulations for the vaporizing of organic solvents, disposal of vapor generated from organic solvents, and control of exhaust emissions from zinc-G plating processes are described.

55652 **APTIC NO. 80709**

Tiller, K. G., R. H. Merry, B. Cartwright, and N. R. Bartlett

DISPERSAL OF LEAD EMISSIONS FROM AN ISOLATED LEAD SMELTER WITHIN AN AGRICULTURAL REGION OF SOUTH ASTRALIA. *Search, 6(10):437-439, Oct. 1975. 11 refs.*

The dispersal of lead emissions from an isolated lead smelter within an agricultural region of South Australia was studied. The background value for surface soils in this region was 10 ppm Pb. Emissions from the Port Pirie smelter have dispersed over at least 3400 sq km east of the Gulf. Areas of 2800, 330, and 270 sq km within the area were contaminated, respectively, to the extent of 1.5 times background, 5-10 times background, and greater than 10 times background. Small areas within 1 or 2 km of the smelter had extractable Pb levels exceeding 100 times background. The Pb fallout patterns confirmed the major influence of wind on emission dispersal. The main features of the Pb distribution were a spread to the south- southeastof the smelter, and high concentrations in the surface soils of the mountain range about 15 km to the east and northeast. Topography and rainfall determined the fallout pattern in the easterly direction. Rainfall associated with the hill front resulted in a more efficient removal of Pb-containing aerosols, thus limiting the easterly spread of the contamination to a range of 40-50 km.

55653 **APTIC NO. 80719**

Tommasi, Salvatore and Alessandro Giadrossi

EXPERIENCES WITH ELECTRICAL FURNACES AT FORCED EMPLOYMENT RELATING TO THEIR CONTRIBUTION TO AIR POLLUTION. *(Esperienze sur forni elettrici a conduzione spinta in relazione al loro contributo al inquinamento atmosferico). Text in Italian. Tec. Ital., 40(1-3):1-12, March 1975. 5 refs.*

The relationship of operating variables in electric furnaces to air pollution was investigated. The characteristic operating parameters include: forcing indexes, the utilization factors, the loading coefficient, and the specific consumptions. These were studied in three plants (two of 40t/op and one of 60t/op) running at different degrees of forcing. Forecast values were in good agreement with actual data in relation to the type of employment adopted, the characteristic operating parameters, and the characteristics of the gaseous emissions, such as load, composition, and the solid content of solid substances in suspension.

55654 **APTIC NO. 73276**

Toyama, Ichiro, Tomizo Nakamura, Yuichi Onuma, and Hiroshi Sano

FORMATION OF NOX IN OXYGEN-RICH COMBUSTION OF HYDROGEN. *(Suiso no sanso fukanensho ni okeru NOx no seisei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 1074, 1975. (Presented at the Japan. Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 4U17.)*

An effect of oxygen as the supporting gas in the combustion of city gas, propane, methane, acetylene, and hydrogen gases is studied concerning the nitrogen oxides formation. The NOx formation was reduced in all types of fuel combustions when the oxygen amount was increased. When oxygen was replaced by ordinary air as the supporting gas, the NOx formation in the hydrogen gas combustion decreased with increased air amount; however the NOx formation increased with increased air amount for the combustions of other gases. If nitrogen gas could be completely removed from the combustion chamber, a NOx formation would have been reduced in a fuel-poor combustion.

55655 **APTIC NO. 80581**

Trumbule, Robert E., Joseph P. Biniek, John E. Blodgett, Maria H. Grimes, and Connie A. Musgrove

RESEARCH AND DEVELOPMENT RELATING TO SULFATES IN THE ATMOSPHERE. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 1-49, June 1975. 30 refs. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.)*

GPO

The nature of atmospheric sulfur dioxide and sulfate pollution, its environmental impact, and methods for controlling such pollution are reviewed. The adverse effects on human health previously attributed to sulfur dioxide alone now appear to be due in larger part to the oxidation products of sulfur dioxide, including sulfuric acid and suspended particulate sulfates. However, there is insufficient information on sulfates at present to permit a complete understanding of the problem. Sulfates and acid rain are also believed to be responsible for considerable damage to fish and wildlife as well as crops and forests. Acidic precipitation also causes damage to buildings and other materials. The primary anthropogenic sources of sulfates in the atmosphere are fossil-fuel burning power plants, smelting operations, and refineries. Catalytic converter-equipped automobiles are also a source of sulfuric acid mist. The primary methods for controlling sulfur oxides from stationary sources are the burning of low-sulfur fuel, the employment of flue gas desulfurization, and the installation of tall stacks in combination with intermittent control.

55656 **APTIC NO. 73441**

Yagira, T., M. Ohira, H. Aoyama, and K. Hatada

CITIZEN S MOVEMENT AGAINST ENVIRONMENTAL POLLUTION AT A RURAL VILLAGE, PART I, POLLUTION BY A ROUGE MANUFACTURING PLANT. *(Ichi noson chiku ni okeru kogai to jumin undo, dai 1-ho, bengara kojo ni yoru kogai). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 30(1):177, April, 1975. (Presented at the Japan Society for Hygiene Annual Meeting, 45th, Kyoto, Japan, April 1975, Paper 325.)*

The rouge manufacturing factory of Toda Industrial Co. is located in a small valley in Okayama Prefecture. Its manufacturing processes emit large quantities of sulfur dioxide, sulfur trioxide, and dusts into the air, and emit sulfate ion into the river. Since the beginning of its manufacture in 1954, damages to health, crops, and the environment were noted. When the manufacturing process was at its peak in 1965, most of the 40 inhabitants near the factory had some kind of difficulty in respiratory functions. The monitoring system for environmental sulfur oxides began in 1967, and it recorded 7.45 mg SO3/day/100 cu m by lead dioxide in 1967. The operation of roasting furnaces in the factory was prohibited in 1971, which reduced the environmental pollution in the area. However, because of a lack of environmental protection enforcement by public offices, the damages in the area are now too great, and the inhabitants are being processed in court for their compensation.

55657 **APTIC NO. 79929**

Yamaguchi, Masaya and Nobuhiro Shimojo

METHYL-MERCURY DERIVATIVES IN ENGINE EXHAUSTS AND ITS SYNTHESIS. *Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):413, 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., 3p., (Presented at the National Conference on Air Pollution, 16th, Japan, Paper 289.)*

Exhaust gas from automobiles using leaded and unleaded gasoline was liquefied and reacted. Methyl mercury compounds were not found in the holding time of gas chromatography. The existence of MMC was confirmed by treating it with hydrochloric acid. The automobile using leaded gasoline produced more MMC than the one using unleaded gasoline. This indicates that the decomposites of ethyl base in tetraethyl lead contained in leaded gasoline contributes to methylation of inorganic mercury. It was shown that gasoline combusted at high temperature and high pressure in an automobile engine produces several hundred ppm of hydrocarbon as a by-product, which becomes a donor of methyl base and reacts with mercury, producing methyl mercury compounds.

55658 **APTIC NO. 80677**

Yoshida, K. and K. Wallace

SPREAD FACTOR OF 2,4-D DIMETHYLAMINE SOLUTION DROPLETS ON INDICATOR COATED PHOTOEMULSION SURFACE. *Preprint, Saskatchewan Research Council, Saskatoon (Saskatchewan), Physics Div., 13p., June 1975. 8 refs.*

The spead factor of 2,4-D dimethylamine solution droplets was evaluated as part of an effort to obtain a precise picture of the droplet size distribution associated with pesticide spray application. A photoemulsion surface treated with a mixture of bromophenol blue indicator and acetone in toluene was used to produce blue stains with a distinct edge on a yellow background upon contact with the water-based spray. The surface was then top coated with ethyl acetate for a permanent record of the images. The spread factor of this surface was determined by measuring the contact angle with a photomicrographic technique using 2% 2,4-D dimethylamine (500-1000 micron diameter size range). The spread factor was expressed as a simple function of 2,4-D amine concentration in the spray solution.

55659 **APTIC NO. 73219**

Kanagawa Prefectural Environmental Center

STUDIES ON HEAVY METAL CONCENTRATION IN ATMOSPHERE. *(Taikichu jyukinzoku to nodo no chosa kenkyu). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:38, Feb. 1975.*

The three year survey results since 1971 on the heavy metal concentrations in the atmosphere at 15 locations in Kanagawa Prefecture is presented. The heavy metal concentrations were high at the Keihin Industrial area, and the central part of the prefecture also showed high concentrations of heavy metals. The lead and iron concentrations were higher at building tops than the ground level for all the locations studied, which indicated the uplift of automobile exhaust gases for lead and the uplift of ground soil for manganese. The correlation coefficient of manganese and iron concentrations was 0.79, and the value tended to be larger in industrial areas. The concentration ratio between Mn and Fe also tended to be larger in industrial areas.

55660 **APTIC NO. 73247**

Tokyo Metropolitan Construction Agency (Japan)

SURVEY TECHNIQUE IN PREDICTING THE EFFECT OF ROAD CONSOLIDATION. *(Doro seibi ni tomonau eikyo yosoku chosa shuho). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 10(1):33-43, Jan. 1975.*

Prediction of traffic numbers was performed by using data obtained by the police department. Parameters for the calculation included the amount of traffic per hour per lane on green traffic lights, the number of lanes, and the time of one cycle from green to yellow to red traffic light. The traffic numbers at peak hours at 3 major intersections ranged from 440/hr/lane to 707/hr/lane. Prediction of carbon monoxide concentration was carried out by using a Gaussian diffusion equation. The emission coefficients for light automobiles, passenger cars, light trucks, and large automobiles at constant speed (40 km/hr) were 11.6 cc/m, 4.3 cc/m, 3.0 cc/m, and 1.2 cc/m, respectively. The predictions, accompanied with the prediction of noise, constituted the survey techniques for investigating the effect of road consolidation.

55661 **APTIC NO. 73304**

RESPONSIBLE SUBSTANCES AND REACTION PRODUCTS IN PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu no genin bushitsu to seissei bushitsu). Text in Japanese. Kankyo Hoken Repoto (Environ. Health Rept.), no. 34:12, March 1975.*

The situation with respect to photochemical smog is summarized based on previous data collected in the Tokyo area. Peroxyacetyl nitrate is the final product in photochemical reactions and its atmospheric level follows the same trend as that of the atmospheric ozone level. The maximum daily levels of both PAN and ozone occurred at a similar period, however the PAN level remained high for a longer period than the ozone level owing to the greater stability of PAN. The ratio between atmospheric concentrations of PAN and ozone fell in a range between 0.03 to 0.10 depending upon the areas. The highest level of PAN observed over a period of two years from 1973 was 31.2 ppb which was comparable to the value reported at Riverside, California (34 ppb). The atmospheric level for non-methane hydrocarbons showed better correlation with the atmospheric carbon monoxide level than with the sulfur dioxide level, which strongly indicated a contribution from automobile exhaust gases; however the contribution from organic solvents could not be neglected. The contribution of unsaturated hydrocarbons to nitric oxide oxidation to nitrogen dioxide was 41% and that of aromatic hydrocarbons was 42%. The average level of non-methane hydrocarbons in early morning (6 am to 9 am) can be used to predict the maximum ozone, nitrogen oxides, or PAN level on that day; however, conclusive relationships cannot be made until more data become available. Sulfate ion concentration found in airborne particulates did not vary between winter and summer periods, and consisted of between 12% to 20% of total dust weight. Suburban areas, however, tended to have higher sulfate ion content in the dusts. Nitrate ion level found in airborne particulates was higher in summer than winter. When atmospheric oxidant levels were higher, higher nitrate ion concentrations was found in the dust.

55662 **APTIC NO. 73342**

Kanagawa Prefectural Environmental Center (Japan), Air Quality Div.

INVESTIGATION ON DUST AMOUNT IN FLUE GAS OF MAJOR DUST-EMITTING FACILITIES. *(Shuyo baijin hassei shisetsu ni okeru endo haigasu chu no baijin ryo no chosa). Text in Japanese. Kanagawaken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:39, Feb. 1975.*

The dust concentration in flue gas was measured at 17 facilities of 8 factories in Kanagawa Prefecture. Higher levels of dust were found in the flue gas emitted from furnaces for glass fusion and drying raw materials. Better analytical data with less fluctuation were obtained when the dust level was expressed with the productivity rather than the amount of fuel consumed. The difference of furnace types for solid waste incineration gave large differences in the emitted dust amounts and the efficiency of dust collectors used in solid waste incineration was the poorest.

55663 **APTIC NO. 80433**

Energy and Environmental Analysis, Inc., Arlington, Va. and AVRAM Co., Falls Church, Va.

AN ANALYSIS OF THE AUTOMOTIVE SULFATE QUESTION. SUMMARY OF FINDINGS. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 174-204, June 1975. (Prepared for the Subcommittee on the Environmenta and the Atmosphere of the Committee on Science and Technology.)*

GPO

The problem of sulfate (and sulfuric acid mist) emissions generated by automobiles equipped with catalytic converters and running on sulfur-containing gasoline is reviewed. The contribution of sulfates from catalyst-equipped cars to the already existing levels of sulfate concentrations throughout the United States is expected to account for 1% of the all sulfates nationwide and 10% of the sulfate concentrations observed in big city street canyon situations after 10 yr of production of catalyst-equipped cars. There is no direct evidence that sulfuric acid mist exerts an adverse effect on human health at levels found in the air, although its irritant action on the respiratory tract is is well acknowledged. Sulfate control levels in excess of 90% without significantly increasing the cost of emission controls appear possible while simultaneously attaining the hydrocarbon and carbon monoxide standards. The primary options for sulfate control include: changes in catalyst formulation, control of excess air, gasoline sulfur control, and advanced emission control systems, including both the dual and three-way catalyst systems.

1974

55664 **APTIC NO. 80865**

Ashby, H. A., R. C. Stahman, B. H. Eccleston, and R. W. Hurn

VEHICLE EMISSIONS - SUMMER TO WINTER. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 30p., 1974. 15 refs. (Presented at the Society of Automotive Engineers Automobile Engineering Meeting, Toronto, Canada, Oct. 21-25, 1974, Paper 741053.)*

A test program to study the effect of ambient conditions on exhaust emissions from a wide variety of automobiles was conducted using 26 cars ranging from pre-control production cars to catalyst-equipped prototypes, including rotary, diesel, and stratified cars. The vehicles were tested at temperatures of 20, 50, 75, and 110 F. Hydrocarbon and carbon monoxide emissions from production and catalyst-equipped prototype cars increased significantly as the ambient temperature was decreased from about 80 F. Catalyst-equipped cars showed less variation than conventional cars in controlling hydrocarbon and CO emissions over a wide range of ambient temperatures. Nitrogen oxides were less sensitive to ambient temperature, although they did increase somewhat as the temperature was lowered from about 80 F. All generations of emission control systems showed significant reductions from precontrolled emission levels at all temperature conditions. The maximum effect of ambient temperature on hydrocarbon and CO emissions occurred in the cold start phase. Exhaust hydrocarbon reactivity was not significantly affected by ambient temperature. Exhaust hydrocarbons from catalyst-equipped cars were less reactive than those from conventional cars. (Author conclusions modified)

55665 **APTIC NO. 80382**

Bartle, E. R.

COMPARISON OF REMOTE SENSING AND EXTRACTIVE TECHNIQUES FOR MEASURING SO CONCENTRATIONS EMITTED BY A COAL-BURNING POWER PLANT (FINAL REPORT). *Science Applications, Inc., La Jolla, Calif., Environmental Protection Agency Contract 68-02-1481, Rept. SAI-74-647-LJ, 45p., Oct. 25, 1974. 2 refs.*

A prototype passive infrared sensor for the remote measurement of sulfur dioxide emissions from stationary sources is described. The infrared radiation emitted by gases in a plume originating from a stack is measured, and the SO2 concentration in the plume is then determined from a knowledge of the spectral characteristics of the radiation. The radiation received by the sensor is a function of the intervening and background atmospheres, the plume temperature, the emissivity of SO2 and interfering species, and the transmissivity of interfering species in the atmosphere. A technique based on the principle of gas filter correlation is used to minimize unwanted effects. Field test measurements at a coal-fired power plant indicate that the remote data are in general agreement with extractive sample data to within 25%. (Author abstract modified)

55666 **APTIC NO. 73651**

Bartz, D. R., K. W. Arledge, J. E. Gabrielson, L. G. Hays, and S. C. Hunter

CONTROL OF OXIDES OF NITROGEN FROM STATIONARY SOURCES IN THE SOUTH COAST AIR BASIN (OF CALIFORNIA) (FINAL REPORT). *KVB Engineering, Inc., Tustin, Calif., California Air Resources Board Contract ARB 2-1471, Proj. ARB-2-387-19, Rept. ARB-R-2-1471-74-31, KVB 5-800-179, 347p., Sept. 1974. 66 refs.*

NTIS: PB 237 688

A comprehensive inventory was made of oxides of nitrogen emissions from stationary sources within the South Coast Air Basin for the period of July 1972 through June 1973. Included are the emissions from over 1500 point sources assessed from detailed device and fuel use information provided by operators, and emissions from area distributed domestic, commercial, and industrial sources, essentially accounting for all fuel burned by stationary sources in the Basin. The inventoried emissions were 15-20% higher than previously estimated. Power plant emissions were dominant, followed by those from refineries. Seasonal variations of emissions were assessed, as was the geographical distribution on a 10 km grid square basis. Forecasts were made of emissions in the several source categories for 1975 and 1980. The amount of stationary source emissions that could be reduced on a cost effective basis equal to or greater than that of current mobile source controls was examined on a device class basis. A substantial portion of the needed reduction can be achieved using combustion modification techniques. (Author abstract modified)

55667 **APTIC NO. 80402**

Chou, J. H. and R. C. Corlett

AN ANALYTICAL INVESTIGATION OF FLUID CARGO VAPOR DISPERSION. *Washington Univ., Seattle, Dept. of Mechanical Engineering, Dept. of Transportation, Contract DOT-CG-34075-A, Rept. CG-D-59-75, 77p., Aug. 30, 1974. 30 refs.*

NTIS, DDC: AD/A-004 487

Means for analytical prediction of the dispersion field of toxic or combustible vapor rented from a tanker are critically evaluated. Particular emphasis is given the conservative delineation of the flammable surface separating spatial domains outside of which dangerous combustion is unlikely and inside of which it is, and an analogous toxic surface, in the light of normally available data and the uncertainties therein. Approximate analyses covering buoyancy and jet momentum effects are included. Work on the external problem is broken down into several subsections dealing with the status of available plume theory and empirical corrections, ignition and flammability limits, dispersive flow past obstacles, and finally a brief consideration of experimental modeling of the effect of helicopter downdraft disturbances. The main features of a model of the internal dispersion problem are outlined for assumed simple geometry. Due to uncertainties of information specifying external dispersion of cargo vapor, notably the ambient wind including its fluctuations, there are severe limits to meaningful precision achievable by any analysis, however refined the underlying physical and mathematical understanding. Within such limitations there are in essence only two plume configurations, one corresponding to a source lying on the ground plane and the other to a source of sufficient elevation to be unaffected by the ground plane. (Author abstract modified)

55668 **APTIC NO. 80634**

Cooper, Hal B. H., Jr., Gary D. Rawlings, and Robert S. Foote

AIR-WATER-LAND INTERFACES OF MERCURY IN URBAN ATMOSPHERES. *AIChE Symp. Ser., 145(71):1-9, 1974. 40 refs.*

Air-water-land relationships of mercury contamination in urban atmospheres are discussed. Mercury is present in the atmosphere, on the land, and in the water in either the organic, inorganic, or elemental forms. The organic alkyl forms of mercury are normally of greatest significance in terms of their potential toxicity. Elemental and organic mercury can be released to the atmosphere by volatilization from the ground or water. The extent of this volatilization is primarily a function of the temperature and the time of day. Mercury is also released to the atmosphere from manmade sources; two major ones are automobiles and municipal waste treatment plants. Mercury entering sewage treatment plants can be reemitted to the atmosphere either from the sludge digester vent gases or from the sludge incinerator during combustion. Most mercury compounds undergo decomposition above 500-550 C during combustion, resulting in the release of elemental mercury vapors during the burning of sludge and fossil fuels. Mercury is returned to the ground from the atmosphere by rainfall (washout) where it may eventually flow into the oceans or be reemitted to the atmosphere. Mercury reaching the oceans or lakes can become a part of the benthal deposits and can be converted to the organic forms. (Author conclusions modified)

55669 **APTIC NO. 80648**

Cross, Frank L., Jr. and J. Ronald Lawson

A NEW PETROLEUM REFINERY - THE ENVIRONMENTAL IMPACT. *AIChE Symp. Ser., 70(136):808-816, 1974. 17 refs.*

A mathematical diffusion model is used to estimate the environmental impact of a hypothetical 100,000-barrel/day refinery located in the densely populated city of Providence, Rhode Island. Estimated sulfur dioxide, total particulate, and carbon monoxide emissions from the refinery are 1606, 80.3, and 1318 tons/yr, respectively, as compared with total contributions from other sources in the area of 139,150, 23,600, and 437,350 tons/yr, respectively. Such estimates in combination with determinations of the costs of alternative control methods are useful in site selection considerations. A general outline of a typical environmental impact statement is presented.

55670 **APTIC NO. 73284**

Deimel, M.

CARBON MONOXIDE, LEAD, OXIDES OF NITROGEN AND BENZO(A)PYRENE POLLUTION IN STREETS OF COLOGNE. *(Kohlenmonoxid-, Blei-, Stickoxid- und Benzo(a)pyren-Belastung in Koelner Strassen). Text in German. Schriftenreihe Ver.-Wasser-Boden-Lufthyg. (Berlin), vol 42:149-164, 1974. 15 refs.*

Results of carbon monoxide, oxides of nitrogen, lead, and benzo(a)pyrene concentration measurements carried out in streets and underpasses in Cologne, West Germany are presented. The annual average CO concentration was 12.5 ppm in busy streets, and 16.5 ppm in underpasses. The summer values were 30-35% lower than those recorded in winter. The CO concentrations were highest during the morning and afternoon rush hours, and lowest at late night as well as on weekends and holidays. High concentrations were measured at wind speeds below 1 m/sec. The average lead concentrations in suspended dust were 4-5 micrograms/cu m in busy streets, and 6-7 micrograms/cu m in underpasses. The oxides of nitrogen concentrations have shown a considerable increase to values over 1 mg/cu m during the past few years. At a traffic density of 1000 vehicles per hour, the benzo(a)pyrene concentration was between 13 and 110 micrograms/1000 cu m in winter and between 3 and 16 micrograms/1000 cu m in summer. A peak of 320 micrograms/1000 cu m was measured in February at a traffic density of 1400 vehicles/hr. Close correlations were established between traffic density and CO(-0.95), lead (+0.96), oxides of nitrogen (+0.92), and benzo(a)pyrene (+0.89), as well as between CO and lead (+0.98), oxides of nitrogen and lead (+0.85), benzo(a)pyrene and lead (+0.89), oxides of nitrogen and CO (+0.86), benzo(a)pyrene and CO (+0.89), and benzo(a)pyrene and nitrogen oxides (+0.91).

55671 **APTIC NO. 80415**

Farmer, Walter J. and John Letey

VOLATILIZATION LOSSES OF PESTICIDES FROM SOILS. *California Univ., Riverside, Environmental Protection Agency Grant 801835, Program Element 1BB039, ROAP/Task 21 AYP 17, Rept. EPA- 660/2-74-054, 87p., Aug. 1974. 37 refs.*

Factors affecting pesticide volatilization from soil surfaces are analyzed, and mathematical models for predicting pesticide volatilization from treated soil are presented. A computer based model is used to predict pesticide volatilization for soil-incorporated pesticides which have significant mobility in flowing water. This model requires a numerical solution of the mass flow and diffusion equations. The volatilization of soil-incorporated pesticides which possess limited mobility in flowing water is predicted using an analytical solution to the diffusion equations. Depending on the initial and boundary conditions which can be applied to the situation, five different models are developed. The solutions to these diffusion-based models are relatively simple compared to the mass flow model. Vapor density relationships and air flow rate are the factors controlling the rate of volatilization when pesticides remain on the soil surface as in the case of non-incorporated pesticides. Rates of volatilization of surface applied pesticides can be predicted on the basis of pesticide vapor pressure following calibration with a known pesticide. Temperature gradients in soil significantly affect the distribution of volatile pesticides in soil. Vapor phase diffusion toward areas of low temperature can occur simultaneously with mass flow in liquid water toward areas of high temperature. (Author conclusions modified)

55672 **APTIC NO. 73649**

Faude, D., A. Bayer, G. Halbritter, G. Spannagel, H. Stehfest, and D. Wintzer

ENERGY AND THE ENVIRONMENT IN BADEN-WUERTTEMBERG. *(Energie und Umwelt in Baden-Wuerttemberg). Text in German. Gesellschaft fuer Kernforschung m.b.H., Karlsruhe, Institut fuer Angewandte Systemtechnik und Reaktorphysik, (West Germany), 171p., April 1974. 100 refs.*

NTIS: KFK 1966 UF

The environmental impacts and energy production and consumption in Baden-Wuerttemberg, West Germany, are investigated with emphasis on the energy conversion sector, i.e., power stations and refineries and upon the regional air pollution problems of the Upper Rhine area. Thermal and chemical emissions, such as of sulfur dioxide, oxides of nitrogen, dust, carbon monoxide, and hydrocarbons, are determined from a regional analysis of the energy statistics of Baden-Wuerttemberg. Currently, industry is responsible for 33% of the total emissions, while the respective shares of households, inclusive of small-scale industry, and traffic are 43% and 24%. Nuclear energy accounted for 2591 GWh in 1971. The energy consumption is expected to rise by 4.3%, and the primary energy consumption by 5.4% yearly from 1971 until 1980. The rate of growth in industrial consumption will be 4%, and that in households and small-scale industry will be 5.2%, and that in traffic only 2.9%. The coal consumption will decrease in both absolute and relative value, and the petroleum consumption will remain fairly constant. The rates of growth for natural gas and nuclear energy will be 19% and 29%, respectively. The long-term maximum allowable SO2 concentration is limited to 400 micrograms/cu m, while a 30-minute peak of 750 micrograms/cu m is allowed once in every two hours. Despite an anticipated 60% increase in the consumption of energy carriers from 1971 until 1980, the SO2 emission is expected to increase by 8% only, and the respective increases in the nitrogen oxides, CO, and hydrocarbon emissions are 21%, 28%, and 30%, while the particulate emissions are expected to decrease by 40%. A map of the regional SO2 concentrations in the Upper Rhine area is calculated from emission and meteorological data.

55673 **APTIC NO. 73279**

Gericke, Dietrich

CONCENTRATION OF NITRIC ACID WITH SULFURIC ACID. *(Konzentrieren von Salpetersaeure mit Schwefelsaeure). Text in German. Chem.-Ing.-Tech., 46(21):894-899, 1974. 11 refs.*

Most nitric acid production facilities belong the the so-called weak acid plants which yield a maximum concentration of 65% HNO3. A suitable method for concentrating the HNO3 is the sulfuric acid process, in which H2SO4 is added to the dilute HNO3 and concentrated HNO3 is distilled off. The heat required has hitherto been supplied directly by steam. Indirect heating has meanwhile become possible by use of borosilicate glass for the concentration unit and tantalum as material of construction for the heater. The process comprises the following stages: pre-concentration of the HNO3 to 67% by weight; concentration of the HNO3 to 99% by weight; reconcentration of the H2SO4; and waste gas scrubbing. The waste gases leaving at the top of the condensation column contain 6 to 9 vol% vaporous nitric acid. The concentration of the acid in the waste is proportional to the waste gas temperature. A waste gas quantity of 100 cu m/hr with a waste gas temperature of 25 C would carry off 0.53 tons HNO3 (100%)/day. The nitric acid of the waste gas is removed in a packed column by washing with cold thin acid which reduces the HNO3 content to 0.09 vol%. The process requires per ton HNO3 (99%) 1.80 tons nitric acid (55%), 0.002 tons sulfuric acid (98%), 3.50 tons steam (12 bar), 110 cu m cooling water (28 C), 16 kWh electric energy, and 55 cu m air (2 to 3 bar). Capital investment costs for a plant size between 100 and 200 tons HNO3 (99%)/day amount to about $22,000/ton HNO3 (99%)/day.

55674 **APTIC NO. 80799**

Hayakawa, Kazunari

THE PROBLEMS AND FUTURE OF COOLING AND HEATING SYSTEMS AT BUILDINGS. *(Biru no reidanbo shisutemu no kongo to mondaiten). Text in Japanese. Sekiyu Gakkai shi (J. Japan Petroleum Inst., Tokyo), 17(4):298-303, April 1974. 2 refs.*

The contribution to air pollution of cooling and heating systems for buildings was 18.6% for sulfur oxides and 2.4% for nitrogen oxides, according to emission data obtained in Tokyo in 1972. Presently, the combination of electric cooling systems and heating systems using primarily heavy oils (including kerosene) for boilers is most common. The reduction in total amount of heat required for heating, use of fuels with low pollutant formation rates, combustion modifications (high combustion efficiency, complete combustion, reduction in NOx formation), removal of pollutants from flue gas and regional cooling and heating systems are discussed from the standpoint of feasibility, economy, and available technology. Design policies for heating systems using oils, city gas, and electricity are described with their characteristics. Existing heating systems in buildings are discussed.

55675 **APTIC NO. 73282**

Hirayama, Naomichi

COMBUSTION IN MUNICIPAL REFUSE INCINERATORS. *(Toshi gomi shokyakuro ni okeru nensho ni tsuite). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan (Tokyo)), 53(571):924, 1974.*

Characteristics of combustion in incinerators are discussed. Waste gas from incinerators containing 4 g/N cu m particulates has a particle size distribution of 20% smaller than 5 micron, 13% 5-10 micron, 20% 10-20 micron, 11% 20-30 micron, 5% 30-40 micron, and 31% larger than 50 micron, while that containing 2 g/N cu m particulates has a particle size distribution of 45% smaller than 5 micron, 27% 5-10 micron, 13% 10-20 micron, 5% 20-30 micron, 6% 30-40 micron, and 4% larger than 50 micron. Electrostatic precipitators can be used to reduce particulates concentration in the waste gas to less than 0.1 g/N cu m. However, a multi-cyclone is needed when the gas contains a large quantity of large particles, in order to retain the same efficiency of the electrostatic precipitator. Waste gas containing about 400 ppm hydrogen chloride can be treated by a venturi packing tower using 0.5 l/B cu m water. The HCl concentration can be reduced to 30-40 ppm and water is regenerated after neutralization. The nitrogen oxides concentration can be reduced significantly by introducing cooling water under the stoker.

55676 **APTIC NO. 73196**

Inagawa, Nagayasu

OUTLINE AND OPERATIONAL RESULTS OF MIIKE COAL-FIRED BOILERS FOR MITSU ALUMINUM CO., LTD. *(Mitsu Aruminiumu Kogyo ni okeru Miike tan* *sensho boira no gaiyo to unten jisseki). Text in Japanese. Karyoku Genshiryoku Hatsuden (Therm. Nucl. Power), 25(12): 1077-1082, Dec. 1974. 1 ref.*

Coal-fired boilers, using Miike coal (low-grade, low-melting, high-coking), and incorporating the latest in pollution control and operational efficiency, are described. Boiler No. 1 (156 MW), has been in satisfactory operation since 1971; Boiler No. 2 (175 MW), scheduled to begin operations in July 1975, is presently under construction, and will have an over-air-port and gas injection fan for nitrogen oxides control. Slagging was controlled by using monowall construction for the boiler, thus providing constant steam temperature, and constant gas temperature. Clinkers were blown away. Effects of ash erosion were minimized by lowering average gas velocities to 10-12 m/sec, and by using suitably placed protectors and baffles. In the reheating section, damper control is by means of bias gas flow, eliminating the need for gas recirculation fans. An electrostatic precipitator, desulfurization apparatus, and high stacks contribute to pollution abatement.

55677 **APTIC NO. 73574**

Katari, V., G. Isaacs, and W. T. Devitt

TRACE POLLUTANT EMISSIONS FROM THE PROCESSING OF METALLIC ORES (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-0321, Task 5, Program Element 1AB015, ROAP 21AUZ-02a, Rept. EPA-650/2-74-115, 280p., Oct. 1974. 106 refs.*

NTIS: PB 238655/AS

Potentially significant sources of hazardous emissions in the metallic ore mining and processing industries were identified. Process flow sheets were prepared for these industries: iron and steel, ferroalloy, primary copper, primary lead, primary zinc, aluminum, titanium, and uranium. Sources of emissions of various pollutants are identified. Sulfur dioxide and volatilized metals are emitted from the iron and steel industry. The Pb sinter process emits 500 lbs of particulates/ton of Pb. Elements present in the particulates include Pb, antimony, cadmium, germanium, selenium, titanium, tantalum, chlorine, fluorine, arsenic, and tellurium. Emissions from Zn roasters contain As, silver, beryllium, Cd, chromium, mercury, magnesium, manganese, nickel, Pb, Sb, Se, stronium, and vanadium, as well as sulfur dioxide. Copper converters emit 240 lbs of particulates and 3500 lbs of SO2/ton of Cu produced. Uncontrolled emissions from the ferroalloy industry range from 40-600 lbs/ton of product. There are 250 lbs of uncontrolled particulate/ton of material charged in the Pb industry. Trace metals in the particulates include: Cd, Cu, Mg, Mn, Ni, Pb, Sn, and V. In copper ore crushing, 200,000 tons of particulates are emitted/yr. In 1970 445,000 tons of particulate were emitted from the material handling process in the iron and steel industry. Fugitive dust is a problem in rural and urban areas. Hydrogen fluoride is the emission of primary concern in the Al industry, while titanium chloride and magnesium chloride vapors are a problem in the Ti industry.

55678 **APTIC NO. 80393**

Leonard, Donald A.

FIELD TESTS OF A LASER RAMAN MEASUREMENT SYSTEM FOR AIRCRAFT ENGINE EXHAUST EMISSIONS (FINAL TECHNICAL REPORT). *Avco Everett Research Lab., Inc., Everett, Mass., Air Force Aero Propulsion Laboratory Contract F33615-71-C-1875, Proj. 3066, Rept. AFAPL-TR-74-100, 86p., Oct. 1974. 28 refs.*

NTIS, DDC: AD/A-003 648

Laser induced Raman and fluorescent measurements were made of the exhaust of a gas turbine engine with a new field portable instrument devised specifically for gas turbine exhaust emission measurements. The gas turbine exhaust was analyzed by conventional instruments for carbon monoxide, carbon dioxide, nitric oxide, other oxides of nitrogen, total hydrocarbons, smoke, and temperature, and these data were used as a calibration standard for the evaluation of the laser Raman instrument. Results thus far indicate good correlations for CO2, oxygen, smoke, hydrocarbons, and temperature. The instrument was not sensitive enough for NO detection but the data analysis indicates that 100 ppm may be detectable with instrument improvements. Carbon monoxide analysis was not attempted, but it is expected that CO could be detected with further research. Nitrogen dioxide or NOx was not attempted because theoretical and experimental laboratory analysis indicated severe interference with CO2. The most severe problem area was laser induced hydrocarbon fluorescence when the exhaust contained large total hydrocarbon concentrations. The overall conclusion was that the laser Raman method shows a good potential for aircraft gas turbine emission analysis. (Author abstract)

55679 **APTIC NO. 80832**

McDowell, G. D.

AN INSTRUMENT FOR MEASURING THE GAS CONCENTRATIONS IN GEOTHERMAL WELLS. *Geothermics, 3(3):100-104, Sept. 1974. 3 refs.*

A method for measuring gas concentrations in steam discharged from geothermal wells is described. Such steam contains non-condensible gases such as hydrogen sulfide, hydrogen, methane, saturated hydrocarbons, and ammonia. The partial pressure of the non-condensible gases in a steam sample is measured at a given temperature and total pressure by deducting the vapor pressure of distilled water at the same temperature from the combined pressure of the water vapor and gases present. The volume of gas in the discharge can be obtained from the differential pressure by the application of the ideal gas law with appropriate data from steam tables. The percentage by weight of gas in the fluid can also be obtained if the chemical composition of the gases present is known. (Author abstract modified)

55680 **APTIC NO. 79885**

McMillen, D. F., R. D. Weaver, and M. Anbar

POLLUTION-FREE ELECTROCHEMICAL POWER GENERATION FROM LOW GRADE COAL (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., National Science Foundation Grant GI-34027, Rept. NSF-RA-N-74-028, SRI PYU-1916, 50p., Jan. 1974. 16 refs.*

NTIS: PB 236162

The feasibility of a combined chemical-electrochemical system for generating electrical power under nonpolluting conditions was studied. The process uses coal or coal products to reduce lead oxide to lead in a molten carbonate medium. The lead contained in the molten carbonate is then used in a metal-air electrochemical cell to generate electrical power. The system appears to be feasible and is capable of producing electrical power from coal at 3.4 mil/kW-hr on the basis of a fuel cost of $10/ton with an overal efficiency of 42%. Since the melt retains hydrogen sulfide and sulfur oxides, the process can operate equally well on high-sulfur coal char at an even lower fuel cost per kilowatt hour. (Author abstract modified)

55681 **APTIC NO. 79878**

Meurer, K.-H.

PNEUMATIC MEASURING SYSTEMS FOR EXHAUST GAS DECONTAMINATION. *(Pneumatische Messsysteme bei der Abgasentgiftung). Text in German. Werkstatt Betr., 107(3):149-150, March 1974.*

Pneumatic measuring systems for vehicle engines, developed to reduc the content of harmful and toxic substances in the exhaust gases, are described. The pneumatic device developed for valve testing, operating on the pressure head principle, eliminates the shortcomings of manual valve adjustment. It has an error of + or - 0.005 mm. This device is equally suited to use in assembly plants and in repair shops. Another pneumatic valve tightness testing device helps identify defective valve guides, seats and valve discs which would give rise to high concentrations of toxic exhaust components. Another pneumatic system, using a reference volume for comparison, is used to measure the combustion chamber volume, a factor which has considerable influence on exhaust emissions.

55682 **APTIC NO. 73283**

Nowak, F. and K. H. Thoemen

THE SECOND GENERATION OF MODERN INCINERATOR/BOILER COMBINATIONS - CONSTRUCTIONAL DETAILS, EXPERIENCES. *(Die zweite Generation moderner Muellverbrennungs-Kesselanlagen - konstruktive Besonderheiten, Erfahrungen). Text in German. VGB Kraftwerkstechnik, 54(10):672-677, Oct. 1974.*

From past experiences with incineration on roller grates an improved second generation of incinerators emerged. Two examples are discussed in particular, that of Stuttgart and that of Duesseldorf. The incinerators in Stuttgart, which went into operation in 1966, had a relatively small combustion chamber with a specific combustion chamber load of about 112,000 kcal/cu m/hr; the flue gas speed of 6.3 m/sec in the first flue above the combustion grate was high because of the small dimensions. The quality of the combustion was unsatisfactory. The new incinerator, therefore, received a larger combustion chamber with a load of about 98,000 kcal/cu m. The flue gas velocity is now 3.6 m/sec due to the wider first flue. The new construction proved to be a success. In a similar way, the shape of the combustion chamber was altered at the new incinerator in Duesseldorf. Here primarily the flue gas path in the combustion chamber was prolonged to give the flue gases sufficient time for complete combustion. A guide vane was installed at the transit of the combustion chamber into the first flue which prevents the exit of unburned flue gas. Through the narrowing of the cross section, flue gases with high surplus air are forced back to the front of the combustion chamber achieving better mixing and a more complete combustion.

55683 **APTIC NO. 73331**

Ose, Youki, Haruo Ukai, Takahiko Sato, Keiko Sasaki, Midori Sekiya, Tetsuya Ishikawa, Ryozo Funasaka, Joji Fukuyama, Yoshimasa Yoshioka, and Reiko Tanaka

STUDIES ON PBULIC NUISANCE CAUSED BY AIR POLLUTION (VII): CO-DISTRIBUTION ON THE ROADS. *(Taiki osen ni motozuku kogai ni kansuru kenkyu (Dai-7-ho): Dorojo no issanka tanso nodo bu pu). Text in Japanese. Gifu Yakka Daigaku Kiyo (Ann. Proc. Gifu Coll. Pharm.), vol. 23:9-16, 1974. 1 ref.*

Carbon monoxide concentration distribution measurements were taken at seven locations (one intersection, five overhead pedestrian bridges, one underpass) in Gifu City, Japan, in March 1971. Samples were collected for 1-hour periods throughout an 8-hour day, from 9:00 am to 5:00 pm. Carbon monoxide concentrations were determined by non-dispersive infrared analysis. Wind direction and velocity greatly influenced concentration distributions, which ranged from 1.5-8.4 ppm, and behaved as expected.

55684 **APTIC NO. 73281**

Otsuka, T.

ELECTRIC POWER AND ENVIRONMENT. *(Denryoku to kankyo). Text in Japanese. Shokubai (Catalyst), 16(6):144-147, 1974. 2 refs.*

Coal consumption for power plants decreased while heavy oil, naphtha, and LNG (liquified natural gas) consumptions increased in the past few years. Total consumptions of coal, heavy oil, naphtha, and LNG in 1973 in Japan were 4.8 million tons, 33 million kl, 24 million kl, and 2.4 million kl, respectively. The average sulfur content of heavy oil was to be reduced to about 0.5% in 1974. From exploitation to refinery to conversion of 4.14 million kl of heavy oil into 5990 million KWH power with various efficiencies at different stages, approximately 87,500 tons/year, 1507 tons/year, and 69,300 tons/years of air pollutants were released at refineries, during transportation, and at power plants, respectively. Approximately 3 million N cu m/hr of waste gas is generated for producing 1 million KW power. A gasification-compound power generating system can utilize heat from gasifications of asphalt and residual oil in a compound power generating cycle so that higher efficiency of power conversion becomes possible.

55685 **APTIC NO. 80392**

Rubins, Philip M., Edward Auerbach, and Jochen A. Deman

PLT 27 GAS TURBINE ENGINE EXHAUST EMISSION AND NOISE MEASUREMENTS (FINAL REPORT). *Avco Lycoming Div., Stratford, Conn., Army Air Mobility Research and Development Lab. Contract DAAJ02-73-C-0068, Task 1G162204A7110, Rept. USAAMRDL-TR-74-61, 107p., Sept. 1974. 15 refs.*

NTIS, DDC: AD A001728

The measurement and analysis of the exhaust gas emissions and the noise emission levels from a Lycoming PLT 27 gas turbine engine are described. The exhaust gases have a low content of unburned combustion products down to idle power due to the high combustion efficiency of this engine. The combustion efficiency is 99.5% at idle and 99.9% above 10% of maximum rated power. The smoke numbers of the PLT 27 engine are extremely low. No visible smoke was produced at any power setting with any of the injector systems tested. The PLT 27 engine meets the exhaust gas emission standards for 1979 for fixed wing aircraft. (Author abstract modified)

55686 **APTIC NO. 73638**

Schwanecke, Rudolf

SAFETY TECHNIQUE AND ENVIRONMENTAL PROTECTION OF FLARES. *(Sicherheitstechnik und Nachbarschutz an Abgasfackeln). Text in German. Verfahrenstechnik, 8(6):171-178, June 1974. 9 refs.*

Environmental problems of high torches in petroleum refineries and chemical plants are described. High torches should be used only in emergency situations because they are unable to provide for good combustion, and consequently cause air pollution. The soot emissions, increasing with the carbon content of the flue gases to be incinerated, can be abated by the injection of relatively large quantities of steam at the top of the flare. The waste gas flow rate should not be higher than 0.2 Mach, and not lower than 2-3 m/sec. Gases generating especially toxic substances when incinerated, such as methyl chloride, ethyl chloride, and hydrogen sulfide, should be incinerated in high torches in cases of absolute emergency only.

55687 **APTIC NO. 79876**

Shaposhnikov, Y., L. Kondakova, M. Stepanova, L. Novgorodskaya, T. Luneva, and I. Kelman

COMPOSITION OF GASEOUS WASTE MANUFACTURE OF DRY ANIMAL FEEDS. *(Sostav gazovykh vybrosov pri proidvodstve sukhikhzhivotnykh kormov). Text in Russian. Myasn. Ind. SSSR, no. 10:16-19, 1974. 8 refs.*

Air samples taken from workplaces and from driers in a meat meal processing plant were analyzed. Workplace air contained traces of sulfur dioxide, up to 20 mg of carbon monoxide per cu m, up to 5 mg of hydrogen sulfide per cu m, up to 4.4 mg of ammonia per cu m, traces of carbonyls, and 0.7-0.9 mg of aliphatic amines. The waste gases from the drying installation contained up to 20 mg of SO2 per cu m, 5-30 mg/cu m of CO, 10-30 mg/cu m of H2S, up to 6 mg/cu m of nitrogen oxides, 2-15 mg/cu m of ammonia, 100-150 mg/cu m of hydrocarbons, 68 mg/cu m of carbonyls, 6.8-32 mg/cu m of organic acids, and 0.1-0.3 mg/cu m of aliphatic amines. Neutral compounds were mainly responsible for odor nuisances. The condensate contained 1% acetic acid, 10.1% propionic acid, 7.6% isooleic acid, and 82.3% isovaleric acid, as well as 84.5% triethylamine, 0.1% butylamine, and 7% pyridine and dibutylamine. Acetaldehyde, propionic aldehyde, methylethylketone, isovaleric aldehyde, methylpropylketone, valeric aldehyde, ethylpropylketone, methylbutylketone, amylformate, n-butanol, and methylamylketone wer found among the carbonyl compounds and in the neutral fraction of the condensate. Waste gas cleaning in meat meal processing plants is best done by incineration at 1000 C or by catalytic oxidation between 300 and 400 C.

55688 **APTIC NO. 73348**

Suzuki, F., M. Mimakami, I. Ogawa, S. Oote, M. Hoshino, A. Matsura, and K. Sato

RESEARCHES ON IODINE EMITTED FROM IODINE-MANUFACTURING PLANTS IN CHIBA. *(Chiba-kenka ni okeru youso seizo kojo karano haigasu-chu youso jittai chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):439, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 290.)*

Measurements were taken of iodine concentrations at three plants in winter and at 12 plants in summer of Chiba Prefecture where more than half of the total iodine production of the world occurs. Exhaust gases were sampled before and after iodine removal by a cleaning tower. The analysis was by absorption with 0.1 N sodium hydroxide and determination by iodide ion electrode method. The iodine concentration in the exhaust was considerably higher in summer than in winter. More than 99% of the iodine was removed by the alkaline solution which was used as the washing reagent. The iodine concentration varied noticeably with time at the same plant. The highest I2 concentrations in flue gas in winter and in summer at the largest producer were 161 ppm and 212 ppm, respectively.

55689 **APTIC NO. 73379**

Tuhara, Isao, Toshio Kitamura, and Yoshio Yamamoto

RESEARCHES ON THE CONCENTRATION OF CARBON MONOXIDE FROM THE AUTO EXHAUST GAS ENTERING THE BUSES DURING THE COMMUTATION HOURS. *(Tsukinji basu nai ni shinnyu suru jidosha haishutsu gasu chuno issanka tanso nodo ni tsuite). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 13, p. 23-26, 1974.*

Carbon monoxide concentrations in buses running on national highway 192 during rush hours were measured from Oct. 28 to Nov. 25, 1972 and from Oct. 29 to Nov. 27, 1973. A Kitakawa type CO analyzer of vacuum method was placed on the back seat and the CO concentration was measured after corrections were made on temperature. In 1972, the CO concentrations ranged from 8.0 ppm to 13.6 ppm between Sako Ichibancho and Sako Hachibancho, from 7.8 ppm to 9.4 ppm between Nishi Shinmachi and Tokushima Station, and from 3.9 ppm to 10.4 ppm between Tokushima Station and Fukushima Bridge. In 1973, the highest CO concentration was found between Sako Ichibancho and Sako Hachibancho at 10.9 ppm to 16.2 ppm. Heavy traffic reduced the average speed and generally increased the CO concentration in buses.

55690 **APTIC NO. 73243**

Takeuchi, Osamu

THE DESIGN OF THE RADIANT TUBE AND ITS COMBUSTION ENGINEERING. *(Rajianto chubu sekkei to nensho gijutsu). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 26(11):31- 39, Nov. 1974. 11 refs.*

The radiant tube has the advantages of freely adjustable furnace environment, easy treatment of exhaust gases, radiation as major heat transfer, and controllable heating temperature. Typical materials for radiant tubes are casted products of carbon, nickel, chromium, and silicon carbide. The materials must have high resistance to heat, high thermal conductivity, high oxidation resistance at high temperature, high creep and rupture strength at high temperature, small thermal expansion coefficient, and high resistance to the furnace gases. Factors to be considered in designing radiant tubes are homogeneous heat distribution, complete combustion in tube and low exhaust gas temperature, large burner contraction ratio and large combustion area, matching combustion method and shape, and good control characteristics. Combustion methods such as exhaust gas recirculation, double tube combustion and dividing combustion can be used for nitrogen oxides reduction.

55691 **APTIC NO. 79884**

Weatherley, M.-L. P. M.

CESSATION OF GAS WASHING AT BATTERSEA B POWER STATION: ANALYSIS OF POSSIBLE EFFECT ON SULPHUR DIOXIDE CONCENTRATIONS, USING NATIONAL SURVEY DATA. *Warren Spring Lab., Stevenage, Herts (England), Rept. LR 191 (AP), 14p., 1974.*

The effect of a cessation in flue gas treatment at the Battersea B Power Station on ambient sulfur dioxide concentrations was evaluate using National Survey data. No increase in annual or seasonal mean SO2 pollution nor in highest 24-hour pollution levels was observed during the cessation of flue gas scrubbing. The effects of the power plant plume on ground level concentrations averaged over 24 h or longer do not appear to be large and are well within the range o variation in SO2 at National Survey sites. Short periods of undesirably high SO2 pollution, if they exist, must be detected wit sampling instruments using a shorter sampling period. (Author conclusions modified)

55692 **APTIC NO. 73647**

Yost, K. J., J. E. Christian, F. G. Faure, H. F. Grant, R. B. Jacko, M. D. Kaser, D. R. Masarik, D. W. Neuendorf, F. E. Peacock, and A. A. B. Pritsker

THE ENVIRONMENTAL FLOW OF CADMIUM AND OTHER TRACE METALS. SOURCE STUDIES (PROGRESS REPORT). *Purdue Univ., West Lafayette, Ind., National Science Foundation Grant GI-35106, 293p., June 30, 1974. 10 refs.*

Field studies designed to identify, characterize, and quantify sources of heavy metal emissions are outlined. Facility descriptions, sampling procedures, and emission test results are presented for a zinc coker plant, a zinc vertical retort, a steel mill open hearth, a municipal incinerator, and three exemplary plants of an electroplating facility. Operating variables are characterized in terms of their effect on the emission of such metals as cadmium, lead, zinc, copper, arsenic, mercury, iron, and nickel. Mass emission rates and calculated emission factors are also presented.

55693 **APTIC NO. 73239**

Yamaguchi Prefectural Inst. of Health (Japan)

SURVEY REPORT OF POISONOUS GASES IN INCINERATION PLANT, PART 2. *(Gomi shokyakujo ni okeru yudoku gasu chosa seiseki ni tsuite, dai 2-ho). Text in Japanese. Yamaguchi-ken eisei kenkyusho nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), vol. 1974:96- 97, 1974.*

An investigation was conducted at a garbage incineration plant at Onoda city. The batch type incinerator had a capacity of 1.88 tons/hr. and was operated 6 hr/day. Plastic wastes were removed from the garbage before incineration. Large size dusts in the waste gases were removed by a screen and the waste gases were then washed by water sprayed from 8 showers before being released. Hydrogen chloride concentration in the waste gas before and after washing was measured by the JIS K 0107 method using mercuric thiocyanate. The HCl concentration in the waste gases was generally low, 2-12 ppm and 2-9 ppm before and after washing, respectively.

55694 **APTIC NO. 73293**

Osaka Prefectural Government (Japan), Environmental Pollution Div., Environmental Pollution Control Office

SURVEY ON SEEKING AFTER THE OUTBREAKING PLACE OF PHOTOCHEMICAL SMOG. *(Kokagaku su-*

mogu ni kansuru hasseigen chosa). Text in Japanese. Kokagaku Sumogu ni Kansuru Chosakenkyu (Res. Rep. Photochem. Smog), vol. 1:264-280, 1974.

As a part of survey on pollutant emission related to photochemical smog formation in Osaka, pollutant concentrations were measured at the emission sources. At an electric power plant, petroleum refinery, and petrochemical plant, the emission concentrations of nitrogen oxides, hydrocarbons, carbon monoxide and oxygen from 11 boilers and five heating furnaces were measured during the period of Jan. 19 to Feb. 28, 1973. The pollutant concentrations (ppm) from boilers and heating furnaces were 45-400 and 65-200 for nitric oxide, 0.1-1.0 and 0.1-10.0 for THC and 0-3000 and 0-10 for CO, respectively. Data on load, load factor, calorific capacity of combustion chamber, sulfur content (0.32-1.4%), and nitrogen content (0.1-0.2%) in fuels, and oxygen concentration (1.0-4.0% for boilers, 5.0-9.0% for heating furnaces) for each case were also collected. The NOx concentration varied with the type of facilities, combustor scale, operational condition and fuel type, while THC showed no characteristic variation. The survey results on the effect of combustion conditions on NOx emission in the case of a glass melting furnace are also included.

55695 **APTIC NO. 73653**

Council on Environmental Quality, Washington, D. C.

THE FIFTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY. *Dec. 1974, 632p. 585 refs.*

GPO

The fifth in a series of annual reports pertaining to factors impacting the environment is presented by the Council on Environmental Quality. Topics covered in the report include: the current knowledge about various land use issues; the environmental, economic, and social impacts of land development; different tools for the control of land development; developments in government programs designed to achieve greater energy conservation and protect air, water, and land quality; estimated costs of pollution abatement activities associated with current environmental programs; trends in environmental quality; the evolution of the National Environmental Policy Act; the development of the United Nations Environmental Program and efforts in international cooperation on matters dealing with the environment; and analytical work performed by the Council on Environmental Quality. Reductions in average ambient total suspended particulates on the order of 25% and 50% reductions in urban sulfur dioxide levels since 1960 are among the air pollution trends observed. Increased emissions of SO2 are noted on a national basis, however. Reductions in carbon monoxide levels during the gasoline shortage were observed along with upward trends in ambient SO2 as a result of the granting of fuel sulfur variances.

55696 **APTIC NO. 80691**

WHO EXPORTS AND WHO IMPORTS POLLUTION? *OECD Observer, no. 70:12-13, June 1974.*

A program designed to determine sources of air pollution in Europe as well as areas being affected by the transport of pollutants is described. Results from the first phase of the program indicate that the main polluting areas in Europe are the industrialized regions of the United Kingdom, the Ruhr area of Germany as well as adjoining parts of Belgium and the Netherlands, and industrialized zones of East Germany, Czechoslovakia, Poland. Sulfur dioxide and particulate data are currently being monitored and are used in conjunction with meteorological data to elaborate a mathematical model of pollution transport. The model, which is already a powerful tool for prediction, is being further refined to provide the basis for an advance warning system.

1973

55697 **APTIC NO. 80654**

Badakhshan, A.

PREVENTION AND CONTROL OF ATMOSPHERIC POLLUTION IN THE IRANIAN OIL INDUSTRY. *Preprint, World Federation of Engineering Organizations, p. 24-40, 1973. 11 refs. (Presented at the Environmental Engineering Conference on Environmental Engineering Problems in Industrial and Developing Countries.)*

Iran s rapid industrialization and population trends cause a variety of environmental pollution problems. Pollution caused by consumption of petroleum products and the measures adopted to control it are discussed. Measures associated with refineries include modernization, air pollution studies for Tehran and Fars refineries, proper maintenance, and determination and measurement of major air pollutants. Iran s natural gas, which had formerly been incinerated, is now being used as a fuel. More than 2000 tons of sulfur, which would otherwise be transformed to sulfur dioxide in flares, are daily produced by Shahpour and Kharg petrochemical plants. Expansion of the petrochemical industry is planned. This will require tremendous amounts of natural gas, which will upgrade Iran s presently wasting natural resource and greatly help reduction of SO2 pollution of the atmosphere. Application of asphalt emulsions (petroleum mulch) in deserts and sand hills, an efficient way of sand stabilization and natural dust control, has been carried out over large areas in different parts of Iran. Application of mulch for stabilization of sandy soils and moisture retention in soil has been successful in increasing vegetation. The predominant difficulties currently hindering effective control of air pollution arise from the generally high cost of control measures.

55698 **APTIC NO. 80650**

Benjamin, S. F.

A STUDY OF TOPOGRAPHICAL EFFECTS ON DISPERSION OF POLLUTION. *Preprint, International Union of Theoretical and Applied Mechanics and International Union of Geodesy and Geophysics, 13p., 1973. 1 ref. (Presented at the IUTAM-IUGG (International Union of Theoretical and Applied Mechanics-International Union of Geodesy and Geophysics) Symposium, April 1973.)*

It is desirable, in cases involving the effect of interactions of particular weather types and unusual topography, to carry out full scale experimental field work at the site in question using a simple pyrotechnical and photographic methods. The method discussed involves fixing a distress signal to the barrel of a 4 ounce rocket. Smoke generation is started at ground level and then the rocket ignited. It climbs to a height of about 400 ft and leaves a red smoke trail which is photographed with motion picture and still cameras. A proposed municipal incinerator site at the foot of a ridge in northern England was studied. Results are described for different weather conditions. A similar investigation was undertaken in Central England for a planned chemical waste incinerator near a steep escarpment. Wind conditions and velocities at various heights were determined. This technique is most valuable for those conditions in which wind tunnel modelling proves most difficult: light or moderate winds with stable stratification. Also in these circumstances the smoke trail is particularly easy to follow. It is possible to study increased turbulence in the wake of obstacles using brown smoke puffs as wind tracers. These investigations represent an attempt to understand flow behavior over arbitrary terrain under a variety of weather situations, so as to gain a body of knowledge from which plume behavior and dispersion can be assessed and by which recommendations on plant design can be made.

55699 APTIC NO. 80684

Chen, Tio C.

AIR QUALITY DISTRIBUTION IN HIGHWAY TUNNEL VENTILATION. American Society of Mechanical Engineers, New York, Fluids Engineering Div., Am. Soc. Mech. Engrs. Joint Meet. Fluids Eng. Div. Appl. Mech. Div., Atlanta, Ga., 1973, p. 161-172. 7 refs. (June 20-22.)

A theoretical analysis of air quality distribution inside highway tunnels with mechanical ventilation systems is presented. Both semi-transverse and transverse ventilation systems are considered. The air flow pattern and the pollution profile inside highway tunnels appear to be sensitive to the location of both supply outlets and exhaust inlets. The traditional design of a tunnel for a mean carbon monoxide level does not achieve that level in the area of the vehicle envelope. Moreover, depending on the type of air distribution system, lower concentrations of CO are measured at the walk areas of the tunnel; thus, CO monitoring levels measured in these areas are not indicative of the mean CO concentration. (Author abstract modified)

55700 APTIC NO. 80963

Cheng, Lung

FORMATION OF AIRBORNE -RESPIRABLE DUST AT BELT CONVEYOR TRANSFER POINTS. *Am. Ind. Hyg. Assoc. J., vol. 1973:540-546, Dec. 1973. 10 refs.*

A laboratory study of the formation of airborne respirable dust by the dropping of broken bituminous coal from a belt conveyor is described. About 10% of the respirable dust adhering to the broken coal becomes airborne owing to dislodgment upon impact. The fraction void in falling broken coal significantly affects the amount of airborne dust formed during dropping. Reduction of the height of material fall reduces the formation of airborne respirable dust. An increase in the thickness of the coal bed reduces the specific formation of airborne respirable dust for heavy belt loads, where bed thickness is much greater than mean lump size. An increase of belt speed reduces dust formation for light belt loads, where bed thickness and mean lump size are approximately equal. The addition of water upstream of the drop point or the use of an inclined chute significantly reduces dust formation. These results are interpreted in terms of the shock dislodgment of dust particles adhering to the broken coal, and the dispersion of the dislodged particles by the surge of air from the space gaps in the impacting pieces. (Author abstract modified)

55701 APTIC NO. 80600

Hanafi, Z. M., K. A. Al. Zewel, A. B. Basily, and A. E. Eid

SPECTROCHEMICAL DETERMINATION OF AL, FE, NI, AND V IN EGYPTIAN BOILER FLY ASH. *Indian J. Technol. (India), vol. 11:228-229, May 1973. 7 refs.*

A method for the spectrographic determination of aluminum, iron, nickel, and vanadium in Egyptian boiler fly ash is described. A mixture of the sample, lithium carbonate, graphite, and palladium chloride (11:33:55:1) is excited in the pore of a graphite electrode, and the composition of the ash is determined by comparing the intensities of the line pairs against those of the reference lines for the internal standard (palladium chloride). A comparison of results obtained by the spectrographic method with those obtained by chemical analysis shows agreement within the limits of experimental error.

55702 APTIC NO. 80895

May, H., W. Mueller, E. Plassmann, and F. J. Dreyhaupt

NEW INVESTIGATIONS OF EXHAUST GAS EMISSIONS OF MOTOR VEHICLE TRAFFIC. *Preprint, Society of Automotive Engineers, Inc., New York, 10p., 1973. 2 refs. (Presented at the Society of Automotive Engineers Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973, Paper 730555.)*

The first results of investigations of motor vehicle emissions are presented for the area of Cologne. The specific emission factors for Otto and diesel engine equipped cars depending upon the mean driving velocity are given. These values can be considered as representative for the Federal Republic of Germany for passenger cars due to the great number of tested vehicles. It is necessary to determine the traffic density of particular roads in the designated area as a function of time to establish specific traffic data. (Author abstract modified)

55703 APTIC NO. 73661

Purushothaman, Krishnier, Jeng-Sheng Hwang, J. Charles Jennett, and Bobby G. Wixson

DEVELOPMENT OF AN AIR QUALITY MONITORING SYSTEM TO CONTROL LEAD SMELTER EPISODES. *Preprint, Missouri-Rolla Univ., Rolla, 19p., 1973. 11 refs. (Presented at the Sanitary Engineering Conference, 23rd Annual, Lawrence, Kans., Feb. 7, 1973.)*

An air quality monitoring system for sulfur dioxide was developed to control lead smelter episodes. The system consisted of a network of four automatic continuous SO2 analyzers with built-in dynamic calibrator encompassing the smelter. They were installed in temperature controlled shelters and telemetered to four in-plant dial indicators that displayed the SO2 levels on a multi-point recorder in the sinter plant control room. With the help of these indicators and the recorder, the plant operator was able to daily monitor the pollutant levels and control the sintering operation (either by decreased production or by shut down) to avert serious air pollution episodes. The SO2 in the main stack emissions fluctuated with the Pb sintering and smelting operations according to whether the sulfuric acid recovery plant was bypassed or not. The number of SO2 episodes recorded with 1-hour average concentrations varying from 0.2 to less than 1.35 ppm are tabulated. There was 134 episodes at the two air monitoringg stations within 2000 ft of the plant and 68 episodes at a station 7200 ft from the plant. The greatest number of episodes occurred at all stations during June and July. The distribution of 24-hour average SO2 concentrations exceeding the Missouri ambient air quality standard of 0.07 ppm is tabulated. During the 9-month period, the arithmetic mean of 24-hour concentrations of SO2 at two stations with 2000 ft northeast and north northwest of the smelter ranged between 0.11 and 0.13 ppm, and at a station 7200 ft south of the plant the mean value was 0.10 ppm. There were totally 35 episodes surrounding the smelter with the highest mean values ranging from 0.17 to 0.24 ppm or from 1.75 to 2.25 times the respective arithmetic mean.

55704 APTIC NO. 80870

Roegener, H.

WATER DROPLET CARRYOVER FROM COOLING TOWERS. *Institution of Mechanical Engineers, London (England), Steam Plant Oper. Conv. Conf. Publ., 1973, p. 95-96. 6 refs. (May 2-4, Paper C118/73.)*

Wet type cooling towers are frequently the cause of environmental interference and annoyance through water droplet carryover. Equations are given describing the condition of the air in the evaporative cooler in terms of air throughput, water throughput, water temperature, coefficient of evaporation, specific enthalpy of the air, and water content of the air. The vapor exhausts in an unsaturated condition in very warm weather, while in cold weather the vapor exhausts in a supersaturated condition from the cooling tower packing. A throttle calorimeter is often used to measure the droplet content. Measured and calculated droplet contents are compared in an actual case. The observed carryover of water droplets can be explained by the condensation during the evaporative cooling process. The spray water content of the total droplet carryover amounted to approximately 10%. Cloud observations are related to cooling towers. A droplet originating in the tower packing through condensation increases in size to a maximum of 20 micron and never reaches the ground but evaporates unless the plume is forced to the ground. Interference encountered with a series of wet type cooling towers should pratically disappear following the installation of drift eliminators. The salt content of the droplets carried over before installation of the drift eliminators was many times that after installation. Therefore, it mainly captures droplets caused by splashing; their average radius must therefore greatly exceed that of droplets from condensation.

55705 **APTIC NO. 80900**

Smith, Bruce W.

ANALYSIS OF THE LOCATION OF COAL-FIRED POWER PLANTS IN EASTERN UNITED STATES. *Econ. Geogr., 49(3):243-250, July 1973. 21 refs.*

A statistical analysis of factors affecting the location of coal-fired power plants in the eastern United States is presented. The spatial configuration of total transport costs is concluded to be the most important factor affecting power plant location. If the differential in transport costs at alternate locations is exceeded by water or land costs, then the latter are traded off with transportation costs. Water and air pollution considerations are expected to assume a greater role in future location decisions. (Author summary modified)

55706 **APTIC NO. 80594**

Vohra, K. G.

POSSIBLE ROLE OF RADIOACTIVE RELEASES FROM MULTIPLE NUCLEAR FACILITIES IN NUCLEATION PROCESSES IN THE ATMOSPHERE. *International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 109-119. 11 refs. (Nov. 12-16.)*

Experiments dealing with the effect of radioactive releases from nuclear facilities on nucleation processes in the atmosphere triggered by ionizing radiation are described. The role of krypton-88 and radon in the production of condensation nuclei was studied and revealed that even a small dose of ionizing radiation in the air can lead to the formation of embryos of nucleation in the presence of trace gases such as sulfur dioxide, nitrogen oxides, and halogens. The acidic condensation nuclei formed differ from those formed in most industrial combustion processes because of their ability to grow by slow chemical reactions to the size of cloud condensation nuclei. Atmospheric effects of gaseous radioactive releases may be particularly enhanced in industrial zones where nuclear power station stacks are located close to conventional industrial stacks.

55707 **APTIC NO. 80660**

Ward, C. C.

SURVEY OF TRACE METALS IN DISTILLATE FUELS. *In: Manual on Requirements, Handling, and Quality Control of Gas Turbine Fuel, ASTM STP 531. Philadelphia, Pa., American Society for Testing and Materials, 1973, p. 133-142.*

Data on trace metals in 408 distillate fuels furnished by 12 laboratories are presented. Metals analyzed include sodium, potassium, vanadium, calcium, lead, copper, and magnesium in samples of kerosene, diesel fuels, burner fuels, jet fuels, and gas turbine fuels. Although the survey does not lend itself to statistical treatment of the data, it does indicate that the level of trace metals in currently produced distillate fuels is much lower than the amounts presently allowed in the American Society for Testing and Materials Specification for Gas Turbine Oils (D 2880-71). (Author abstract modified)

55708 **APTIC NO. 80899**

Widawska-Kusmierska, J.

THE OCCURRENCE OF GALLIUM IN POLISH BITUMINOUS COALS. *Bull. Acad. Pol. Sci., Ser. Sci. Terre, 21(1):1-7, 1973. 19 refs.*

The occurrence of gallium in Polish bituminous coals is reviewed. The average gallium concentration in coals from different mines ranges from 11.22 to 23.11 g/ton of coal or 67.13-107.3 g/ton of ash. The highest gallium concentrations are found in the Orzeskie and Rudzkie layers (of limnic origin) and in Jaklowieckie layers (generally of paralytic origin but also including many lymnic strata).

55709 **APTIC NO. 73597**

VDI (Verein Deutscher Ingeneiur), Duesseldorf (West Germany), Kommission Reinhaltung der Luft

HEAVY METALS-LEAD, ZINC, AND CADMIUM-BIBLIOGRAPHY (1970-1972). *Preprint, 81p., Jan. 1973. 304 refs. (Presented at the VDI (Verein Deutscher Ingeneiur) Reinhaltung der Luft Kolloquium, Duesseldorf, West Germany, Feb. 22-23, 1973.)*

An annotated bibliography of 304 references on environmental pollution by heavy metals is presented. The bibliography covers 1970-1972 and emphasizes lead, zinc, cadmium, and mercury. The abstracts are arranged alphabetically by the first author. There is a comprehensive subject index in both English and German.

1972

55710 **APTIC NO. 80599**

Agrawal, B. B. and S. F. Fish

TRACE METALS IN CRUDE OILS FROM ASSAM OIL-FIELD, INDIA. *Indian J. Technol. (India), vol. 10:117-119, March 1972. 11 refs.*

The trace metal content of crude oils from three different oilfields in the Assam region was investigated. Losses incurred during the preparation of inorganic ash from different crude samples were determined by dry ashing, sulfated ashing, and wet ashing procedures. The wet ashing procedure gave the most reliable values. Trace levels of vanadium, iron, nickel, copper, magnesium, sodium, potassium, and calcium were observed in the following ranges: less than 0.3 ppm, 4.81-8.28 ppm, 0.99-1.46 ppm, 0.16-0.46 ppm, 0.16-0.30 ppm, 0.56-5.11 ppm, 0.29-0.51 ppm, and 1.73-5.82 ppm, respectively. (Author abstract modified)

55711 **APTIC NO. 80826**

Bonk, H. W., Henri Ulrich, and A. A. R. Sayigh

SOLVENTLESS URETHANE COATINGS. *J. Elastoplast., vol. 4:259-279, Oct. 1972. 7 refs.*

Progress in the development of solventless solid urethanes for spray and spread coating applications is reviewed. Solventless coatings preclude air pollution problems associated with the release of toxic vapors in manufacturing and application processes. Topics covered include: a general description of urethane coatings, the chemistry and raw materials for solid urethane coatings, characteristics and applications of sprayable solventless urethane formulations, spread coating of solventless urethane coating systems, and typical spread coating formulation and application.

55712 **APTIC NO. 73598**

Heap, M. P., T. M. Lowes, and R. Walmsley

EMISSION OF NITRIC OXIDE FROM LARGE TURBULENT DIFFUSION FLAMES. *International Flame Research Foundation, Ijmuiden (Netherlands), Int. Combust. Symp. Proc., 1972, p. 883-895, 1973. 14 refs.*

The emission of nitric oxide from large-scale natural gas and pulverized-coal flames was studied and observed to be dependent on the type and position of the fuel injector and the degree of swirl in the combustion air. The effects were apparently burner phenomena because the bulk furnace-gas temperature was too low to support significant NO formation. Generally, minimum NO emissions occurred when 20% of the stoichiometric air requirement was injected with the fuel. Nitric oxide emissions varied by over 50 ppm with the same fuel and excess air levels. The temperature profiles of flames with different structures and heat-release patterns were different, while NO flue gas concentrations were similar. A simple empirical model based on the concept of dividing the furnace into a well-stirred tank and plug-flow section was only capable of giving approximate emission predictions and indicating trends due to variations in preheat and heat-release patterns. The model did not satisfactorily predict the effect of residence time, probably because the measured residence times were dominated by the external recirculation which did not contribute to the final NO concentration under the conditions of the experiment. (Author abstract modified)

55713 **APTIC NO. 80837**

Kahn, Herbert L., Frank J. Fernandez, and Sabina Slavin

THE DETERMINATION OF LEAD AND CADMIUM IN SOILS AND LEAVES BY ATOMIC ABSORPTION SPECTROSCOPY. *Atomic Absorption Newsletter, 11(2):42-45, March-April 1972. 8 refs. (Presented at the Agronomy and Environmental Quality Meeting, New York, Aug. 1971.)*

Atomic absorption spectrometry was used to determine lead and cadmium in soil samples after both acid and acetate extractions and in leaves after digestion in nitric acid. Acid extraction gave consistently higher results than did acetate for soils. Lead levels in all soil and leaf samples were sufficiently high to permit the use of a standard atomic absorption instrument with a conventional burner. A Delves microsampling system was used in conjunction with the burner to improve the sensitivity for cadmium detection. The Delves system also proved useful for determining lead in leaves directly (without prior dissolution). The lead distribution in leaves was not homogeneous. (Author abstract modified)

55714 **APTIC NO. 73376**

Sugimoto, T., K. Yamazaki, N. Fukuie, and Y. Jo

STUDIES ON PARTICULATE EMISSION FROM AUTOMOTIVE GASOLINE ENGINES. *(Jidoshayo gasorin kikan no haishutsu suru biryushi ni kansuru kenkyu). Text in Japanese. Nihon Jidosha Kenkyusho Hojo Jigyo Hokokusho (Japan Auto. Res. Inst., Inc., Rept.), vol. 1972: 95-109, March 1972. 7 refs.*

Particulate emission from automotive gasoline engines was studied under laboratory conditions, with leaded and non-leaded gasoline as fuel, and with or without catalytic muffler. In bench tests, under normal driving conditions, sizes of emitted particulates were below 1.5 micron. Under identical engine conditions, 98% of the particulates from the use of leaded fuel were below 0.1 micron in size. However, for both leaded and non-leaded fuel, about the same number of particulates, greater than 0.1 micron in size, were present. Particulate emission concentrations and size frequency distributions differed with driving conditions. When pellet-type catalyst particulates (in 500 mg catalyst, commercially available: 53.7 mg copper; 60.0 mg iron; 14.8 mg chromium; remainder, aluminum were used as exhaust purification catalysts, emission of catalyst particulates from the tailpipe was observed. The size of particulates ranged from 0.1-1.5 micron. Effective analysis of particulate composition can be performed with an X-ray microanalyzer, when particulate sizes are above 0.1 micron. In simple airborne particulate tests within a room, when leaded gasoline was used, concentrations of particulates below 0.4 micron in size were high, and these particulates remained airborne for a long time.

55715 **APTIC NO. 73399**

Saitama Prefectural Government (Japan), Div. of Civil Administration

SURVEY REPORT ON THE AUTOMOBILE EXHAUST GAS IN THE ATMOSPHERE 1972. *(Taikichu ni okeru jidosha haigasu chosa kekka ni tsuite). Text in Japanese. 44p., 1973.*

Monitoring data, collected at various intersections in various cities in Saitama Prefecture, Japan, during 1972, are tabulated. Factors measured included atmospheric pollutants (carbon monoxide, lead, nitrogen dioxide), frequency of traffic at the intersections, and meteorological conditions (weather, wind direction, wind velocity, and temperature).

55716 **APTIC NO. 80396**

SCS Engineers, Long Beach, Calif.

SOLID WASTE COMPOSITION AND EMISSION FACTORS FOR SELECTED NAVAL ACTIVITIES. *Navy Contract N62399-72-C-0017, Proj. YF 38.554.001.01.002, Rept. CR 73.011, 321p., Dec. 1, 1972. 3 refs.*

DDC: AD 910118

Basic planning information on solid waste sources, emission rates, classification, and composition for five Navy shore installations is presented based on field survey activities conducted during the summer of 1972. The information is intended to aid in establishing a framework around which a solid waste generation and systems design model can be developed and to provide criteria for the selection and evaluation of handling methods for solid wastes. In addition to the identification of solid waste composition and the calculation of emission factors, environmental effects resulting from solid waste processing and/or disposal are considered. Effects on the air are categorized as either visual (smoke) or odorous. A listing of the potential environmental effects of common solid waste materials is presented.

1971

55717 **APTIC NO. 73310**

Jo, Y. and H. Jo

THE IMPROVEMENT OF THE IGNITION RATE OF MIDGET TWO-CYCLE GASOLINE ENGINE DURING IDLING. *(Kogata 2-saikuru gasorin kikan no aidoringu doki no chakkaritsu kaizen). Text in Japanese. Nihon Jidosha Kenkyusho Hojo Jigyo Hokokusho (Japan Automobile Research Inst. Inc., Rept.), vol. 1971:41-47, June 1971. 5 refs.*

Ignition and idling characteristics were investigated for midget 2-cycle gasoline engines, where the combustion chamber was one of two types (hemispherical, or wedge). The wedge-type chamber proved superior. Laminar flow followed the wall to reach the neighborhood of the plug, and its behavior favorably influenced flame characteristics during idling. When an exhaust throttle valve was installed and properly adjusted in conjunction with the wedge-type chamber, the rate of gas flow from the exhaust tube was controlled so that negative pressure within the cylinder and rapid drop in crankcase pressure did not occur. Because crankcase pressure decreased gradually, there was no increase in blowback to the crankcase from exhaust pressure and the supply ratio did not decrease. Ignition during idling was much improved, and maximum pressure remained more stable.

CONTROL METHODS

1976

55718 **APTIC NO. 81024**

Turnhout, J. van, C. van Bochove, and G. J. van Veldhuizen

ELECTRET FIBRES FOR HIGH-EFFICIENCY FILTRATION OF POLLUTED GASES. *Staub, Reinhaltung Luft, 36(1):36-39, Jan. 1976. 4 refs.*

The use of electret filters for the filtration of submicron particles in air is discussed. The filters have an open structure and are made of corona-charged split fibres of polypropylene.

They have been tested with sodium chloride and DOP aerosols and have also been exposed to humid indoor air and to industrial air. For a filter weight of 360 g/sq m, initial efficiencies as high as 99.5% and pressure drops as low as 6 mm water were found at an air velocity of 20 cm/s. Although the electret charges are shielded by the particles captured, the efficiency only drops by a few percent when the filters are loaded up to 5 weight percent. For solid aerosols, such as NaCl, the change is even less.

1975

55719 **APTIC NO. 80942**

Adams, Jack C.

TWO CONTROLLED HIGH TEMPERATURE WASTE TO ENERGY PROJECTS. *Adams Creative Environmental Systems, Red Lion, Pa., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 503-506. (Nov. 3-5.)*

Two controlled combustion systems designed for high efficiency burning of pulverized coal, lignite, and peat, or intermixes with refuse derived fuel (RDF) are discussed. The processes are characterized by long particle retention time in the combustion zone, internal supplementary preheated air; multizone combustion; and controlled fuel-air ratio. The application of these principles creates a unique combustion environment in which the maximum heat, value to the fuel is obtained by the reduction of excess air (less than 25% is needed for complete combustion), and the resulting high combustion temperature. The greatly lowered volume of exhaust gases and the complete combustion obtained makes extensive exhaust gas scrubbers and related air quality control equipment unnecessary.

55720 **APTIC NO. 80740**

Agrest, Jacobo

RESIDUES CONVERSION TO CHEMICALS AND ENERGY. *Engineering Faculty of Buenos Aires, Buenos Aires (Argentina), Conver. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 525-531. 6 refs. (Nov. 3-5.)*

Spent quebracho sawdust, from which tannin has been extracted by diffusion, consists of 48.5% fiber, 1.5% incentives, and 50% water. Theoretically it could provide the power and steam requirements of a plant, without any additional external power or commercial fuels supply; but, in practice, this is not always the case, especially if high extraction efficiency and quality are desired. Burning moist spent quebracho sawdust directly does not allow required high efficiencies to be attained. If spent quebracho sawdust is upgraded to raw material for furfural production, the remaining residue, furfural spent sawdust, is strictly limited, and more external power and commercial fuels are needed. Unless systematic criteria are applied, and a careful hookup designed, incorporating fuel drying and correct combustion methods, available spent quebracho sawdust will not allow an energy self-sufficient operation. (Author abstract)

55721 **APTIC NO. 81020**

Ahuja, R. D. and V. K. Batra

FLARE SYSTEM--A VERSATILE TOOL OF ENVIRONMENTAL ENGINEERING. *Chem. Age India, 26(7):531-535, July 1975. 4 refs.*

The principles and operation of a flare system for the combustion of industrial waste gas are discussed. In the flare system, effective burning and smokeless, noiseless and non-luminous flame is achieved by injecting steam and air which improves mixing at the flare tip and also takes part in the combustion reaction. Flares can be designed as elevated flares, ground flares, or burner pits. The quantity of the steam required for smokeless combustion is one-third of the gas mass flow (refinery gas). In the case of severe emergencies, the steam quantity required for total smokeless combustion is only attained for normal and small flare gas quantities. A flare is designed to be smokeless for 10-15% of its total capacity.

55722 **APTIC NO. 80973**

Akagi, S., Y. Mizoguchi, N. Hazeki, and Y. Takuma

THE COMPUTER-AIDED CONTROL OF THE REFUSE INCINERATOR. *Hitachi Shipbuilding and Engineering Co., Ltd., Osaka, Japan, Environmental Systems Design Dept. and Omika Works of Hitachi Ltd., Tokyo, Japan, 2nd Computer Control Design Section, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 452-457. 2 refs. (Nov. 3-5.)*

The use of a minicomputer in the combustion control of incinerators in refuse incinerating plants is described. Practical advantages of minicomputerization include: better utilization of energy by maintaining stable combustion, complete combustion of scheduled amount of refuse, decrease of damage of equipment, better pollution control, and labor saving. Instrumentation was developed to monitor the states and burning conditions of refuse in the incinerator quantitatively. A combustion control system was established which regulates predrying grate speed, main grate speed, combustion air A, and combustion air B.

55723 **APTIC NO. 80954**

Alvarez, Ronald J.

STATUS PAPER ON CONVERSION OF SOLID WASTE TO ENERGY ON THE NORTH AMERICAN CONTINENT. *Hofstra Univ., Hempstead, N. Y., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 130-135. 2 refs. (Nov. 3-5.)*

A study of the status of the generation of energy from municipal type solid waste in North America is presented, based upon a 1975 survey. The facilities are classified as refractory wall plants with waste heat recovery, boiler type plants burning shredded solid waste, pyrolysis plants, and plants with water wall construction. The design capacity, year of start-up and information on principal equipment is tabulated. Information on steam generation, resource recovery, and economic data is included.

55724 **APTIC NO. 80567**

Ambrose, E. R.

EXCESSIVE INFILTRATION AND VENTILATION AIR. *Heating Piping Air Conditioning, 47(12):75-77, Nov. 1975. 11 refs.*

Areas in which energy reductions can be achieved by using minimum ventilation air quantities are discussed. They include: standards for different operating conditions that are based on authentic data and give recommended minimum ventilation air qualities to satisfy all safety and health requirements; uniformity in federal statutes and local and state ordinances; fundamental system designs based on sound engineering principles to take full advantage of the recommended requirements; acceptable procedure for using purification equipment; recommended infiltration rates for residential installations; and research and development to obtain factual data that can serve as a guide for establishing minimum ventilation rates for the health and safety of the occupants. For example, each 1000 cfm reduction of outdoor air represents a saving of about 3 ton in cooling equipment and 80 MBtuh in heating equipment. With a heat pump system, this could cause an annual operating cost reduction of approximately 30,000 KWH.

55725 **APTIC NO. 73377**

Ando, Junpei

DIFFICULTIES IN FLUE GAS DESULFURIZATION AND DENITRIFICATION TECHNIQUES IN JAPAN AND U.S.A. *(Nichibei no haien datsuryo oyobi dassho no mondaiten). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(2):77-82, Feb. 1975. 3 refs.*

The difficulties encountered in flue gas desulfurization in Japan and the U.S.A. were discussed at the EPA Flue Gas Desulfurization Symposium held in Atlanta in Nov. 1974. Problems presented by the most commonly used wet lime method, in which sulfur dioxide is absorbed by lime milk or limestone slurry, are scaling caused by gypsum deposition on walls of absorption tower and pipes and the corrosion of equipment. The case of Ohmuda power plant where desulfurization is carried out successfully by the wet lime method is presented. The problem of lime-calcium sulfite slurry disposal is discussed with a comparison of data on disposal water analysis and the formation quantity of gypsum. The economic aspect of desulfurization was also discussed with cost analysis. The desulfurization cost is 5 mills per one kw in Japan compared to 2-3 mills in the U.S.A. The matter of pollution control expenses and the basic principle of not including such expenses in the cost of products are reviewed with case studies. Denitrification by means of absorption of nitrogen dioxides converted from nitric oxide by catalytic oxidation and by the catalytic reduction to harmless nitrogen gas are discussed. The rationality of nitrogen oxides control standards is evaluated from the economic standpoint.

55726 **APTIC NO. 73424**

Ando, Junpei

FLUE GAS DENITRIFICATION AND DESULFURIZATION. *(Haien dassho to datsuryu). Text in Japanese. Preprint, Japan Management Association, p. 3, 1975. (Presented at the Environmental Pollution Control, Technical Symposium, Tokyo, March 17, 1975.)*

Information about desulfurization and denitrification facilities for flue gas treatment are presented in tables. The items presented in the tables are the names of inventors, treatment methods, treated gas capacity, installed locations, and productivity of byproduct. The tables also contain listings of the desulfurization facilities at U. S. power stations. The desulfurization methods presented at the direct and indirect limestone methods and the sulfuric acidd method.

55727 **APTIC NO. 73452**

Ando, Junpei

NOX COUNTERMEASURE AND FLUE GAS DENITRIFICATION. *(NOx taisaku to haien datsusho). Text in Japanese. Kankyo Kenkyu (Environ. Studies), no. 9:12-20, March 1975.*

Denitrification techniques for gases are reviewed. Although denitrification techniques by wet methods are more advantageous than the dry methods, the former techniques have more difficulties than the latter. For example, nitric oxide is inactive and hardly absorbed by liquid and the cost of oxidizing agents, such as ozone, chlorine dioxide, and potassium permanganate to covert NO to more reactive nitrogen dioxide is very expensive. The absorption rate of NO2 by alkaline solution is 0.2 to 0.1 that of sulfur dioxide, therefore a huge absorption tank is necessary for effective denitrification. The dry methods, especially calalytic reduction by ammonia, are most promising; however, the lifetime of catalyst is still one of the difficulties associated with the dry methods. The nitrogen oxides environmental standard of Japan is the tightest one in the world, aiming for a daily average of 0.02 ppm. In order to meet this standard, every stationary NOx emission source is expected to lower its Nox emission to 180 to 230 ppm which is the lowest level that improvement of techniques of combustion can attain. This means that every emission source must install expensive denitrification equipment. The operation of such denitrification equipment is very expensive and consumes valuable energy and natural resources, and the 0.02 ppm standard may not be necessary since it is now doubtful that the low NOx would reduce photochemical reactions very much. Expensive denitrification equipment should be installed only at high NOx emission sources, such as nitric acid manufacturing factories, and other lower NOx emission sources should be directed to lower their emissions level by the best possible means of improving their combustion system without adding a denitrification facility. Since automobile exhaust NOx contributes 40% of the atmospheric NOx level in Tokyo, the installation of denitrification equipment to automobiles should not be exempted.

55728 **APTIC NO. 73203**

Aoyama, Hyogoro

EXHAUST PURIFICATION TECHNIQUES FOR GASOLINE-POWERED AUTOMOBILES. *(Gasorin jidosha no haiki joka gijutsu). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(6):68-79, Feb. 1975. 19 refs.*

Thee present status of automotive exhaust purification techniques is surveyed. REAPS (Rotary Engine Anti-Pollution System, Toyo Kogyo Co.) and CVCC (Compound Vortex Controlled Combustion, Honda Technical Research Industries) meet 1975 standards for carbon monoxide and hydrocarbon emissions in Japan, but further improvements in pollutant control are necessary. Also discussed in this article are: causes and sources of gasoline-powered automobile pollutants; exhaust gas purification by engine improvements; improvements in air-intake systems; exhaust gas treatment by exhaust installations; and exhaust gas recirculation systems.

55729 **APTIC NO. 79933**

Aoyama, Heigoro, Yuichi Horio, Koji Tsuchimoto, Hideo Ouchi, Akihik Oi, Seiichi Nakamura, Masatomi Suzuki, and Naotomi Yamaki

PURIFICATION CHARACTERISTICS OF EXHAUST HYDROCARBONS BY AUTOMOBILE OXIDATION CATALYSTS. *(Jidoshayo sankashokubai ni yoru haikitankasuiso no jokatokusei). Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4), 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., 4p. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Japan, Nov. 5-7, 1975.)*

Endurance tests were carried out on oxidation catalytic converters, and the question of changes caused in their purification characteristics with respect to exhaust hydrocarbons was examined. Copper-chromium and platinum catalysts were tested with an engine and an engine tester. Sample purification characteristics were evaluated with a reactor and a gas sample consisting of a diluted mixture of typical hydrocarbons. The results were compared with those of reactions with simple alumina. Components were analyzed b gas chromatograph. The overall reaction rate was the weighted average of the reaction rates of the hydrocarbons. The hydrocarbon concentrations were calculated from their reaction rates and their photochemical reactivity values were used to compute the decrease rates in their reactivity. The olefins and the aromatics reacted at lower temperatures than the saturation hydrocarbons. The decrease rates in photochemical reactivity for the same overall reaction rates were greatest for platinum system catalysts, less fo the Cu-Cr system catalyst, and least for alumina, indicating that P system catalysts would permit a more selective removal of hydrocarbons which are high in photochemical reactivity. This capacity did not vary considerably even with the used catalysts sampled. This capacity was also more or less of the same magnitude even when unleaded gasoline was used.

55730 **APTIC NO. 80761**

Asahina, Etsuo, Kuniho Yokota, Kenji Nakase, and Chu Wakabayashi

PURIFICATION METHOD OF GAS CONTAINING SULFUR DIOXIDE WITH SULFUR FORMATION. *(Genso iou no seisei o tomonau nisanka iou inyu kitai no seiseiho). Text in Japanese. (Chiyoda Chemical Engineering and Construction Co., Ltd. (Japan)) Japan. Pat. Sho 50-17439. 5p., June 20, 1975. (Appl. Nov. 2, 1971, 1 claim).*

A method for the absorption of sulfur dioxide with an aqueous solution of the alkali salt of malic acid, and the conversion of the SO2 to sulfur with hydrogen sulfide is described. A mixture of 2 kg malic acid, 500 ml 28% ammonia water, and 280 g NaOH was dissolved and diluted to 6 l with water. The solution was divided into two portions and used to fill two absorbing towers 7 cm in internal diameter and 130 cm in height. Sample gas containing 0.3% SO2, 3.4% oxygen, 13% carbon dioxide, and 83.3% nitrogen was supplied to the bottom of the towers for 15 hr at 8 l/min. The SO2 concentrations in the resulting gas from the first and second towers were analyzed with a detector tube. The SO2 concentration in the final gas was below 40 ppm. Approximately 96% of the total SO2 were absorbed in the first tower; the other 4% were absorbed in the second tower. Sulfur (46 g) was recovered from the first tower after passing H2S at 80 ml/min for 6 hr at room temperature.

55731 **APTIC NO. 80918**

Asaoka, Hiroshi

DEODORIZING METHOD AT THE PAPER MILLS. *(Seishi kojo no dasshu hoho). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 20(11):28-34, Nov. 1975.*

Sensitivity to offensive odors varies according to the individual, which makes it technically impossible to control an odor to please everybody. However, the Offensive Odor Prevention Act promulgated on June 1, 1971 regulates the offensive odors generated by paper mills in Japan and restricts the odor intensity within the range of 2.5 to 3.5. The deodorizing methods being used at Japanese paper mills, especially at kraft pulp processing plants, for control of offensive odors due to ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethyl amine are described. Technology for kraft pulp processing is among the most ingenious and most advanced, with the one grave disadvantage of emitting malodors. Therefore many efforts have have been made to control these offensive odors, resulting in such measures as separation and collection of odorous gas, incineration and desulfurization of gas, and improvement of the kraft pulp processing equipment. The sulfur-free pulp pilot plant of the Japan Paper Pulp Research Institute is mentioned.

55732 **APTIC NO. 80955**

Azegami, M. and S. Suzuki

URBAN-RURAL ENVIRONMENTAL COMBINATION PROGRAM. *PRAND Corp., Ltd., Tokyo, Japan, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 73-78. 2 refs. (Nov. 3-5.)*

The principles of the urban-rural environmental program of Japan are outlined. Domestic and some industrial solid wastes are separated into five categories: high calorie wastes, low calorie wastes, reclaimable wastes, pollutant wastes, and land fill wastes. High calories wastes are incinerated and converted to energy, while low calorie wastes are converted to compost and utilized in farms as soil improvers. Reclaimable wastes include glass bottles and empty cans. City inhabitants are requested to separate pollutant wastes containing heavy metals and polychlorinated chemicals. The quality and quantity of landfill wastes are checked before dumping, and fill sites are directed by an information control system. Thhe program includes the recovery of waste heat for use in greenhouses, the incineration of high-calorie agricultural wastes, resource recovery as a public enterprise, and the use of low calorie wastes for farming fertilizers.

55733 **APTIC NO. 80908**

Barak, M.

PERSPECTIVES OF THE LEAD BATTERY IN THE ELECTRIC AUTOMOBILE. *(Perspektiven des Bleiakkumulators im Elektrofahrzeubgau). Text in German. Metall (Berlin), 29(9):944-947, 1975.*

Perspectives of lead batteries and recent development in the area of electrically powered vehicles in Great Britain and other countries of Western Europe are presented. It has been possible to increase the energy density of lead batteries to 33 Wh/kg and to increase the service life to about 1500 cycles, which corresponds to an action radius of 60-70 km between two chargings. The action radius can be increased by the use of hybrid drive, with battery drive reserved for city traffic. An experimental bus with an action radius of 65 km and a top speed of 65 km/hr is being tested in Great Britain. The Enfield 800 model 2-seat passenger car has an action radius of 90 km at a top speed of 65 km/hr. Over 120,000 electrically powered vehicles are currently in operation in Great Britain. An increase of the action radius to about 160 km is expected from sodium-sulfur batteries currently under development. The energy density of this battery is 5 to 10 times that of conventional lead batteries.

55734 **APTIC NO. 80916**

Bauer, J., R. Hakmann, and E. Nitschke

FLUE GAS DESULFURIZATION. PROCESS CHARACTERISTICS OF WET AND DRY FLUE GAS DESULFURIZATION EXEMPLIFIED BY THE IFP AND SFGD PROCESSES. *(Rauchgasentschwefelung. Verfahrensmerkmale der nassen und trockenen Rauchgasentschwefelung, dargestellt am Beispiel des IFP- und SFGD-Verfahrens). Text in German. Erdoel Kohle-Erdgas- Petrochem., 28(7):328-335, July 1975.*

The wet type flue gas desulfurization process developed by IFP (Institut Francais du Petrole) and the west desulfurization method by SFGD are described. According to the IFP process, sulfur dioxide is absorbed by ammoniacal solution in water and bound chemically in the form of ammonium sulfite and disulfite. For regeneration of the ammoniacal solution, thee sulfite is thermally decomposed by evaporation into ammonium and SO2 which latter is partly reduced to hydrogen sulfide by means of natural gas. Liquid sulfur is obtained in a modified Claus process. The overall efficiency of this method amounts to 85%. The purified flue gases are reheated before they are discharged into the atmosphere. In the SFGD dry process SO2 is adsorbed on copper oxide, followed by regeneration in a hydrogen/steam mixture in an exothermal reaction. A Claus plant is used to obtain elementary sulfur. A pure SO2 stream can be taken from a downstream absorber-stripper with buffer function continuously despite cyclic SO2 discharge from the regeneration unit.

55735 **APTIC NO. 80975**

Bendersky, D., L. J. Shannon, P. G. Gorman, W. R. Park, and J. R. Holloway

ST. LOUIS REFUSE FUEL DEMONSTRATION PLANT - TECHNICAL AND ECONOMIC PERFORMANCE. *Midwest Research Inst., Kansas City, Mo. and Environmental Protection Agency, Washington, D. C., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 7-13. 3 refs. (Nov. 3-5.)*

Air pollution control at the St. Louis refuse fuel demonstration plant is described. The combustion gases from the boiler are sent through an electrostatic precipitator to remove particulates prior to discharge through the stack. The bottom ash residue from the boilers is sluiced periodically into a settling pond, where the water drains off, leaving a solid residue. The only major equipment change at the processing plant is the addition of an air classifier to help remove the nonburnables from the shredded refuse. Descriptions of the fuel preparation process and the power plant facilities, production and yield data, the characteristics of the refuse fuel, equipment performance, and costs are included.

55736 **APTIC NO. 80410**

Benza, Stephen T. and Ann E. Lyon

THE USE OF LIME, LIMESTONE AND OTHER CARBONATE MATERIAL IN THE NEW COAL ERA. *Preprint, J. E. Baker Co., York, Pa., 12p., 1975. 6 refs. (Presented at the NCA/BCR Coal Conf. Expo., 2nd, Oct. 21-23, 1975.)*

The use of lime, limestone, and other carbonate materials for coal gasification and wet and dry flue gas desulfurization processes is reviewed with particular emphasis on estimated future requirements for these materials. The equivalent of 50 new lime plants, each with an average capacity of 200,000 tons/yr, appears required for meeting the increased demand for lime, assuming that all wet scrubbers used for removing sulfur dioxide from flue gases emitted by coal burning operations use lime as a reactant. Coal gasification cannot be considered a potential market until around the 1980 s because of the extremely high costs hindering present commercial application.

55737 **APTIC NO. 80503**

Berg, Lennart

STATE OF THE ART OF TECHNOLOGIES AND ODOR CONTROL IN SULPHATE PULP FACTORIES. *(Zum Stand der Technologien und der Geruchskontrollen in Sulfatzellstoff-Fabriken). Text in German. Allg. Forstz., 30(32):638-640, 1975. (Presented at the International Conference on Clean Air Maintenance Problems in the Wood Processing Industry, at the Trade Fair on Industrial Environment, Jonkoping, Sweden, 1974.)*

The state of the art of technology and odor control in sulfate pulp production is presented. Malodorous emissions containing hydrogen sulfide and methylmercaptan are collected and incinerated to sulfur dicxide for odor control. To reduce the load of the incinerator, and also the quantity of the SO2 generated, it will be necessary to scrub the malodorous gases with an alkaline solution for the retention of part of the malodorous sulfur compounds. In addition, the sulfur input in the technological process will have to be reduced as much as possible, and the use of sulfur should be possibly eliminated.

55738 **APTIC NO. 80502**

Berg, P. J. van den, A.C. Smit, L. Hellmer, and A. G. Montfoort

THERMAL DECOMPOSITION OF CALCIUM NITRATE AND ITS APPLICATION IN THE NITROGEN FERTILIZER INDUSTRY. *(Die thermische Zersetzung von Calciumnitrat und ihre Anwendung in der Stickstoffduenger- Industrie). Text in German. Chem.-Ing.-Tech., 47(20):845-846, 1975. 2 refs.*

A new economical method for the thermal conversion of calcium nitrate in fluidized-bed reactors in nitrogen fertilizer production is described. Natural gas is used for thermal conversion. However, high natural gas prices in certain areas may make it necessary to use sulfurous fuel oil. In this case, the sulfur dioxide generated in the combustion process is probably combined with calcia, which eliminates air pollution due to SO2.

55739 **APTIC NO. 79920**

Blazowski, W. S. and D. E. Walsh

CATALYTIC COMBUSTION: AN IMPORTANT CONSIDERATION FOR FUTURE APPLICATIONS. *Combust. Sci. Technol., 10(5/6):233-244, 1975. 29 refs.*

A large scale experiment was performed in which fuel was burned within a catalytic bed using air preheated to 650 K. Since this scheme requires the design of a system which results in uniform fue air mixing and a uniform velocity profile, the exhaust gases closel approximate isothermal plus flow, thus avoiding many additional current system disadvantages due to severe temperature gradients. Testing was conducted at pressures up to 10.5 atmospheres and exhaust temperatures up to 1589 K. This operation corresponded to lean combustion and resulted in stable combustion with nitrogen oxides emission levels two orders of magnitude below those corresponding to a conventional gas phase combustion design under identical conditions. Performance trends with fuel air ratio, inlet temperature, reference velocity, and pressure were established. Some explanation of these trends was offered. A literature search was conducted to collect available catalytic oxidation information. Characteristics of noble metal and transition metal oxides are discussed. Results are interpreted wit respect to possible future applications. (Author abstract modified

55740 **APTIC NO. 73299**

Boda, Itsuji

A DEODORIZER FOR SANITARY NIGHT-SOIL CAR. *(Eisei kumitori jidosha ni okeru dashu sochi). Text in Japanese. (Nippon Air-Wick Service Co., Ltd. Omihachiman-shi (Japan)) Japan. Model Util. Sho 50-10445. 2p., April 2, 1975. 1 ref. (Appl. Dec. 13, 1967, 1 claim).*

A deodorization apparatus for sanitary night-soil carriers equipped with a vacuum pump is described. The deodorization of the vacuum exhaust is accomplished by mixing humus with a deodorizing liquid within the vacuum exhaust pipe. The humus is generated by blowing compressed air over a deodorizing liquid bath which is equipped with a float that adjusts the liquid level in the bath. The generated humus is sprayed from a nozzle into a ball-shaped chamber in the vacuum exhaust pipe. The nozzle is angled so that the sprayed humus moves in a circular motion within the chamber leading to an efficient mixing with the odor. The compressed air pump is operated electrically; thus, the carrier driver can activate the deodorization apparatus remotely.

55741 **APTIC NO. 80411**

Boehman, L. I. and J. E. Davison

PERFORMANCE OF A RICH COMBUSTION REFRACTORY METAL COMBINED CYCLE POWER PLANT. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Am. Inst. Chem. Engrs. Air Pollution Control Assoc. Proc. 3rd Natl. Conf. Energy Environ., College Corner, Ohio, 1975, p. 1-8. 17 refs. (Sept. 29-Oct. 1.)*

The concept of a rich combustion refractory metal combined cycle power plant is discussed. The oxidizing environment present in conventional engine combustors and turbines can be eliminated by utilizing fuel-rich combustion for the first combustor, thus providing a reducing environment for the refractory metal alloy turbine blades. The products of combustion from the first stage of combustion can subsequently be burned in a second combustor which may be part of a conventional gas turbine engine or steam power plant boiler. The use of a fuel-rich combustion stage followed by a slightly lean combustion stage also results in reduced nitrogen oxide emissions. Overall system thermal efficiencies in excess of 50% appear to be attainable with molybdenum alloys presently available.

55742 **APTIC NO. 80953**

Bremner, R. M., A. Fraser, A. G. Turton, and D. P. Sexsmith

PARAMETERS DETERMINING DESIRABILITY OF REFUSE FIRED STEAM GENERATORS FOR CENTRAL HEATING AND COOLING IN CANADA. *Dept. of Public Works, Toronto (Ontario), National Capital Commission, Ottawa (Ontario), and James F. MacLaren, Ltd., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 157-136. 2 refs. (Nov. 3-5.)*

The effect on air quality of refuse fired steam generators for central heating and cooling in Canada was investigated. In a 4-year study in Toronto all of the heating schemes, which appeared to be economically feasible, were evaluated in an air quality model developed by the Provincial Ministry of the Environment. In addition to the use of the Air Quality Model to determined pollutant concentrations in the atmosphere over the city, mathematical simulations of individual chimney plumes were used to examine the effects of various district heating plant effluent gases on many of the tall buildings in the central part of the city. Although the Air Quality Model shows an improvement in overall air quality resulting from increases in district heating with corresponding decreases in emissions from the existing mix of small gas, oil, and coal fired heating plants, there is no discernible difference between a district heating system with all plants burning gas and oil and one which includes a refuse fired plant.

55743 **APTIC NO. 80743**

Cadogan, J. B. and L. Eisenberg

ENVIRONMENTAL CONTROL OF ELECTRIC POWER SYSTEMS. *ISA (Instr. Soc. Am.) Trans., 14(3):217-224, 1975. 34 refs. (Presented at the Instrument Society of America International Instrumentation- Automation Conference and Exhibit, New York, Oct. 28-31, 1974.)*

A number of environmental power dispatch strategies have been proposed that allow for consideration of environmental effects in scheduling generation. Historically, electric power systems have scheduled their generation to minimize operating costs. Those strategies which seek to control or minimize system emissions are classified as emission control strategies. Environmental control strategies seek to control either ground level pollutant concentrations or some function of these concentrations. The emission control strategies function in an open loop mode, where pollutant emissions are predicted from static input-output curves for each generator. Environmental control strategies function in either an open loop or in a closed loop mode. Ground level pollutant concentrations are predicted through the use of air quality modeling in the open loop mode. When a closed loop mode is used, concentrations are measured and this information is used to modify the system operation. Because emissions control strategies do not directly consider air quality, they are used in addition to normal air quality procedures which still must be employed. This is similar for the case of most environmental control air quality standards. Environmental strategies can be useful during air pollution emergencies when a power system is required to limit its emissions and shift load outside the affected area. (Author abstract modified)

55744 **APTIC NO. 80968**

Chapman, Richard A.

DEVELOPMENT OF A SOLID-WASTE-FIRED GAS TURBINE SYSTEM. *Environmental Protection Agency, Cincinnati, Ohio, Office of Research and Development, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 343-348. 1 ref. (Nov. 3-5.)*

The newly designed granular filter used in the pilot plant of a solid waste fired gas turbine system as the final stage of hot gas cleaning is described. The plant was tested using municipal solid waste, wood waste, and high sulfur coal. Turbine deposit and erosion problems led to the development of a granular filter that is designed to remove the erosion and deposit-causing particulates. Hot dirty gas enters the top of the pressure vessel and passes radially outward through a panel of aluminum oxide media. Particulate matter is deposited on the filter media which is continuously withdrawn from the bottom of the panel and pneumatically transported to a fluidized bed above the filter. The action of the pneumatic transport system and the fluidized bed removes the collected ash from the media prior to its return to the top of the filter panel. Based on atmospheric pressure testing of the small filter segment, a collection efficiency of 97% at a pressure drop of 6.9 kPa is predicted for the filter. The mean size of the pilot plant particulate at the granular filter inlet is 2 micron.

55745 **APTIC NO. 80949**

Chisamore, G. C. and R. M. R. Higgin

ONTARIO RESOURCE RECOVERY PROGRAM. *Ministry of the Environment, Toronto (Ontario), Resource Recovery Branch and Ministry of Energy, Toronto, Technical Studies, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 482-487. 4 refs. (Nov. 3-5.)*

A systems approach to the recovery of energy and materials from solid waste was adopted in Ontario. Key components of the system include: use of computer modelling techniques to optimize the location of plants and the operation of the Provincial network; technology development at the experimental plant; operations development at front end plants and other demonstration projects; utilization of the full resources of the Provincial government and industry to develop markets and new uses for recovered materials; and formation of a Waste Management Advisory Board to provide policy direction for the reduction of waste. A cost estimate for the burning of solid municipal wastes as a supplementary fuel in Ontario s existing electric power generating stations is given.

55746 **APTIC NO. 80971**

Cohan, L. J., J. H. Fernandes, M. E. Maguire, and R. C. Shenk

PREPARED VS. UNPREPARED REFUSE FIRED STEAM GENERATORS. *Combustion Engineering, Inc., Windsor, Conn., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st., Montreux, Switzerland, 1975, p. 407-415. 2 refs. (Nov. 3-5.)*

Refuse is prepared by sizing, separating the noncombustibles, and firing the remaining combustibles in suspension. With prepared refuse, suspension firing is possible, permitting lower excess air operation and minimum corrosion because of the removal of some trace metals such as copper, zinc, and aluminum. Environmental compatibility is a major concern in any modern system. Refuse burning is not feasible unless the applicable environmental regulations are met. With low excess air suspension firing systems, there is a substantial reduction in the gas quantities to be cleaned and this is reflected in the cost of air pollution control equipment.

55747 **APTIC NO. 80675**

Cox, William L.

THE TIRE-FIRED BOILER. *Environmental Protection Agency, Washington, D. C., Environ. Prot. Agency Proc. Environ, Aspects Chem. Use Rubber Process. Oper., Akron, Ohio, 1975, p. 371-380. (March 12-14.)*

The use of scrap tires as fuel for generating steam in boilers employing the rotating hearth concept of Lucas American Recyclers is discussed in terms of heat recovery efficiency, cost savings, and air pollutant emissions. The firing of scrap tires recovers about 40% of the thermal equivalents of all the fossil fuels consumed as raw materials and energy in the construction of the original tire. Particulate emissions are below the maximum allowable emission of 0.65 lb/1000 lb dry gas for coal-fired boilers generating less than 100,000 lb of steam/hr, and sulfur dioxide emissions are only a third of those permitted for soil fuel-fired boilers in Michigan. Particulate matter in the off gas is surprisingly high in zinc which is apparently reoxidized by excess air to zinc oxide. This zinc may be recovered and reprocessed by proper design of subsequent installations. Tire-fired boilers burning scrap tires costing $20/ton are predicted to yield cost savings of from 34-56% when compared to those burning conventional fuels.

55748 **APTIC NO. 80669**

DeLuca, J. P., L. L. Murrell, R. P. Rhodes, and S. J. Tauster

THE STABILIZATION OF RUTHENIUM ON MGO. *Preprint, Exxon Corp., 18p., 1975.*

Laboratory experiments investigating the stabilization of ruthenium automotive reduction catalyst materials on magnesium oxide are reported. Although ruthenium is a good catalyst for the reduction of nitrogen oxides, it volatilizes when exposed to conditions found in automobile exhaust gas. Tests with ruthenium supported on magnesium oxide reveal that the partial pressure of ruthenium oxide species above the catalyst is drastically reduced. Multi-layered oxide systems utilizing monolithic supports are capable of withstanding temperatures of 850 C in air while remaining catalytically active.

55749 **APTIC NO. 73254**

Dietrich, H. and H. C. Guertler

FIBER FILTERS - ALSO WITH CHEMICAL EQUIPMENT. *(Filterfilzeauch mit chemischer Ausruestung). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 25(3):65-71, March 1975. 5 refs. (Presented at the Meissgas-Symposiums der Firma DuPont, Duesseldorf, West Germany, Oct. 9, 1974.)*

The preparation, structure, advantages, and outlooks of needle- punched fiber filters in industrial dust separation are described. Needle-punched filters are used most often in the form of bag filters with pneumatic or mechanical dust removal at intervals. Polyacrylonitrile filters withstand flue gas temperatures up to 110-120 C, while the corresponding temperature limits for polyester, aromatic polyamide, and polytetrafluoroethylene are 140- 150 C, 200-220 C, and 260-280 C. Nomex filters are suitable for dust separation at temperatures between 150 and 220 C. Nomex filters with + CS or Rezept 15 finish give considerably prolonged life and exceptionally high resistance to chemicals as compared with untreated Nomex filters. It is more economical to dedust hot flue gases by means of temperature-resistant fiber filters than to apply energy-consuming flue gas cooling.

55750 **APTIC NO. 80574**

Dumont, Philippe

FLUE GAS DESULFURIZATION WITH LIME. *(La desulfuration des fumees par la chaux De ontzwaveling van rook door middel van kalk). Text in French and Flemish. Ann Mines Belg., no. 2:181-189, Feb. 1975. 3 refs.*

There is a growing tendency in Japan, the U. S., and Germany to use lime as an absorbent to reduce sulfur-containing emissions. The process of absorbing sulfur dioxide by means of lime is well understood, and offers the advantages of desulfurization at a high level of efficiency and low investment and operating costs. (Author abstract modified)

55751 **APTIC NO. 80997**

Ellenberger, H. U.

AN EXAMPLE OF GOOD WASTE MANAGEMENT IN THE PLASTIC/CHEMICAL INDUSTRY. *OFAG ZUERICH, Zurich (Switzerland), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 550-554. (Nov. 3-5.)*

The design of an incinerator plant for waste management in the plastic/chemical industry is discussed. The incinerator was designed similar to black liquor boilers and has three flues. In the center on the top of the first flue a combined heavy oil and hydrocarbon waste burner produces a hot downward flame. The aqueous wastes are sprayed by eight atomizer nozzles tangentially to the hot core of the central flame. Water is evaporated and the dried waste burns with production of carbon dioxide, water, and soda. Seventy percent of the soda moves as an extremely fine aerosol with the flue gas through the boiler, producing scales and deposits on the heat exchange surfaces. The surfaces are cleaned periodically by soot blowers. The soda remaining in the flue gas is then dissolved in water in a high efficiency venturi scrubber.

55752 **APTIC NO. 73589**

Fairchild, C. I., J. Farr, M. Gonzales, E. L. McGuire, and M. I. Tillery

COMPUTER ASSESSMENT OF AIR CLEANER PERFORMANCE IN TERMS OF MASS, NUMBER CONCENTRATION, HAZE FORMATION POTENTIAL, AND RESPIRABLE MASS. *In: Annual Report of the Biomedical and Environmental Research Program of the LASL Health Division. California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab., Energy Research and Development Administration Contract W-7405-ENG. 36, Rept. UC-48, p. 23-25, Feb. 1975. 4 refs.*

NTIS: LA-5883-PR

A computer analysis of several typical industrial air cleaners was performed to determine the relationships between efficiency in terms of mass collection of other aerosol parameters such as respirable mass, light-scattering cross section, total surface area, and number of particles. The analysis was achieved by computer generation of aerosols having different log-normal size distributions and then characterization of the challenge aerosol with respect to the above parameters. The analysis of a small-diameter tubular cyclone handling an aerosol with a volume median aerodynamic diameter of 10 micron and a standard deviation of 2.5 gave a mass collection efficiency of 80%, a number collection efficiency of 24%, a respirable mass removal efficiency of 52%, and a 60% removal of potential haze formation particulates. Thus, mass collection efficiency can be a misleading index of performance with respect to other aerosol parameters for air cleaners having moderate to good mass collection efficiencies and challenge aerosols having a wide size distribution. Mass collection efficiency is a reasonable index of air cleaner performance with respect to other parameters for efficient cleaners (e.g., electrostatic precipitators) and for challenge aerosols having narrow size distribution.

55753 **APTIC NO. 80913**

Fischer, W.

ELECTROCHEMICAL STORAGE CELLS. *(Elektrochemische Speicher). Text in German. Technica, 24(18):1337-1348, 1975. 14 refs.*

New electrochemical storage cells and their possible uses are described. New electrochemical storage cells, especially sodium-sulfur batteries, can be advantageously used to power vehicles, particularly in city traffic, which implies a considerable abatement of air pollution in urban areas. Electrochemical batteries can also be used to store power plant-generated electricity for use during peaks. Sodium- sulfur batteries permit a considerable weight reduction as compared with conventional lead batteries. An electrically powered passenger car is expected to weigh about 20% more than a conventional one, and the differences would be even smaller for delivery trucks, vans, and autobusses.

55754 **APTIC NO. 80996**

Flanagan, B. J.

PYROLYSIS OF DOMESTIC REFUSE WITH MINERAL RECOVERY. *Oxy Metal Industries, Birmingham (England), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 220-225. (Nov. 3-5.)*

The composition of oil obtained from the pyrolysis of municipal refuse is compared to fuel oil derived from petroleum. At 0.1 to 0.3% by weight, the sulfur content of pyrolytic oil is a good deal lower than even the residual oils. Because it is lower in both carbon and hydrogen, and contains much more oxygen, the average calorific value is about 24,347 KF/Kg compared with 42,202 KF/Kg for a typical no. 6. A barrel of oil derived from the pyrolysis of municipal waste contains about 76% of the heat energy available from no. 6. Pyrolytic oil is more viscous than a typical residual. The typical products of pyrolysis are tabulated for the oil fraction, char fraction, gas fraction, and water fraction.

55755 **APTIC NO. 80976**

Flanagan, M. J. and G. A. Horstkotte, Jr.

AN INTEGRATED APPROACH TO WASTEWATER AND SOLID WASTE PROCESSING. *Brown and Caldwell Consulting Engineers, Walnut Creek (Calif.), Process Control Div. and Central Contra Costa Sanitary District, Walnut Creek, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 293-298. 4 refs. (Nov. 3-5.)*

Air pollution control at a proposed integrated wastewater and solid waste processing facility is discussed. Ferrous metal, aluminum, and a combustible fraction can be recovered in a fully mechanized, dry classification-type resource recovery plant. The combustible solid waste fraction can be pneumatically conveyed to the water reclamation plant, to provide the fuel for lime recalcination and sludge incineration. The off gas can leave each furnace at a minimum temperature of 760 C and pass through a dry cyclone scrubber to remove particulate matter 10 micron or greater in diameter. The gas stream from each scrubber can then be fed to a waste heat boiler to recover the sensible heat and produce 1035 kPa saturated steam. The exit temperature of the gas stream from the waste heat boiler would be 232 C. Following wet scrubbing, the clean off gas can be exhausted to the atmosphere at 38 C.

55756 APTIC NO. 80787

Fujii, T., A. Muraguchi, and H. Nishiuchi

SURVEY REPORT ON THE DUST REMOVING DEVICE OF CUPOLA. *(Kyupora jojin sochi chosa hokoku). Text in Japanese. Shiga Kenritsu Kikai Kinzoku Kogyo Shidosho Gyomu Hokoku, vol. 1975:21-25, 1975. 7 refs.*

Dust removing devices produced by 15 manufacturers for cupola furnaces are reviewed. The devices can be classified into two major types, the dry and the wet types. The dry type apparatus employs bag filters, and the dust concentrations after treatment are well below 0.1 g/N cu m in all cases. Some bag filters use stainless steel filters and are capable of filtering high temperature gas without a cooling device. The dust concentrations in waste gases after treatment by wet type venturi scrubbers are slightly higher than for bag filters. A dry type apparatus generally has a higher dust removing rate and less secondary pollution than wet type apparatus. Investigations conducted at five plants revealed that dust concentration in waste gas could be reduced to 0.006 mg/N cu m by a bag filter.

55757 APTIC NO. 80763

Fukui, Saburo, Masumi Atsukawa, Haruo Kuwabara, and Tetsuro Urabe

STACK GAS DESULFURIZATION METHOD PRODUCING GYPSUM AS BY-PRODUCT. *(Sekko o fukusei suru haien datauryu hoho). Text in Japanese. (Mitsubishi Heavy Industries, Ltd. (Japan)) Japan. Pat. Sho 50-17318. 4p., June 19, 1975. (Appl. Dec. 29, 1970, 3 claims).*

A stack gas desulfurization method using calcium hydroxide and/or calcium carbonate as absorbent is described. Exhaust gas was introduced to a cooler where the temperature was reduced and dusts were removed. The cooled gas was led to the first absorbing tower to which absorbent was supplied from the second absorbing tower. Portions of the absorbent in the first absorbing tower were pumped to a settler where gypsum was recovered. The resulting gas from the first absorbing tower was led to the second absorbing tower to which lime slurry was supplied. The pH values at the first and the second towers were maintained at below 4 and above 6, respectively. Bubbling devices were equipped at both towers to increase the absorbing efficiencies. Waste gas containing 0.1 vol% of SO2 was treated at 50 N cu m/hr with 5% Ca(OH)2 slurry (3 l/hr), and the overall SO2 absorption rate was 90-94%.

55758 APTIC NO. 81006

Funk, Harvey D. and Arnold O. Chantland

SOLID WASTE FOR POWER GENERATION FUEL IN A SMALL CITY. *Henningson, Durham and Richardson, Omaha, Neb. and City of Ames, Iowa, Dept. of Public Works, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 268-273. (Nov. 3-5.)*

A solid waste recovery system based on the supplementary boiler fuel principal is described. The city of Ames, Iowa successfully burns the combustible fraction of the solid waste in its three power plant boilers, yielding these benefits: an economical alternative to landfilling; a more environmentally acceptable method of disposal; a new, reliable, readily available source of low sulfur fuel; and conservation of natural resources. The plant accepts all general household and commercial wastes including such items as white goods, tires, trees, furniture, and other bulky wastes. Items not acceptable are demolition materials, automobiles, liquids, and contaminated and hazardous wastes.

55759 APTIC NO. 73335

Furuhama, Shoichi and Ikuo Yamaguchi

OPERATIONAL CHARACTERISTICS OF HYDROGEN-OXYGEN ENGINE. *(Suiso- sanso enjin no unten tokusei). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 27-30, 1975. 4 refs. (Presented at the Japan Society of Mechanical Engineers Lecture Meeting, Tokyo, Japan, April 1-3, 1975, Paper 726.)*

A single cylinder, spark ignition gasoline engine was revised for hydrogen-oxygen combustion characteristic study. Ignition was converted from magnetic type to battery type for a wider range of ignition period. More than 99.99% pure hydrogen and oxygen were supplied at reduced pressures of 0-1 kg/sq m G and 2 kg/sq m G, respectively. Excess and blow-by hydrogen gas was released to the atmosphere and the cooling water temperature was maintained at 75-80 deg. Results showed that the spark ignition engine could be operated by using pre-mixed H2-O2 gas and the output was dependent on volume efficiency, equivalent ratio, and ignition period. Minimum equivalent ratio for maximum output was determined as 4.5 by early ignition. At low load, ignition became impossible when equivalent ratio reached about 8. Hydrogen gas in exhaust required treatment by exhaust gas recirculation.

55760 APTIC NO. 80728

Furukawa, Eisaburo

INTERNAL COMBUSTION ENGINE. *(Nainen Kikan). Text in Japanese. (Takagi, Tadashi (Japan)) Japan. Pat. Sho 50-32891. 3p., Oct. 25, 1975. 1 ref. (Appl. Dec. 30, 1970, 1 claim).*

A compression ignition type combustion engine was designed that prevents the release of toxic substances, such as carbon monoxide, hydrocarbons and nitrogen oxides, contained in the exhaust gas of internal combustion engines. Two torque converters installed in an engine and supported by the crankcase, cylinder and cylinder head were employed. This system converts reaction heat energy into torque and totally combusts the properly proportioned air/fuel mixture separately aspirated from the combustion air supply, which is added to the mixture after the mixture is sufficiently activated. The rotation of the crankshafts are synchronized. The combustion chambers are connected by a passage. One torque converter has an air/fuel mixture aspirating valve and a spark plug while the other has an air aspirating valve and a combustion gas exhaust valve. The air/fuel mixture (normally air 15: gasoline 1) and the air are adiabatically compressed. The air/fuel mixture in one cylinder is readily ignited, just before it reaches upper dead center, when the spark plug emits an electric spark. Flames immediately spread through the passage into the other cylinder where they are completely combusted, due to the ample supply of air.

55761 APTIC NO. 73333

Furukawa, Toshiharu, Yoshihiko Suzuki, Shigeru Masumoto, Nobuo Masuda, and Isamu Eguchi

STUDIES ON A HOT GAS SELF-RECYCLING TYPE BURNER: PART 3, VARIATION IN THE AMOUNT OF NO FORMATION WITH DIFFERENT FUEL ATOMIZATION METHODS. *(Netsugasu jiko saijunkan shiki bana no kenkyu, 3 yufunmu keishiki no chigai ni yoru NO seiseiryu no henka). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 792, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 1046.)*

The amount of nitric oxide and hydrocarbon formation in a low NO self-recycling burner in which hot combustion gas is recycled and mixed with water vapor to atomize fuel in the combustion furnace were studied. The temperature of the fuel-mixed recycled gas was about 500 C and did not vary with fuel to air ratios between 0.8 to 1.1. For the same range of fuel to air ratio, the furnace temperature gradually increased from 800 C to 900 C, while the temperature of recycled gas decreased from 1060 C to 850 C. At a fuel to air ratio of 1, the burner produced 37 ppm NO. If fuel itself was atomized, the temperature of the fuel-mixed recycled gas increased to 670 C leading to NO formation of 54 ppm under a fuel to air ratio of 1. The GC analyses for the combustion gases indicated that the percentage of low molecular weight hydrocarbons produced was higher for the water atomized fuel than for the simple fuel atomization.

55762

APTIC NO. 79866

Gabler, Robert C., Jr., B. W. Dunning, Jr., R. E. Brown, and W. J. Campbell

PROCESSING CHALCOPYRITE CONCENTRATES OF A NITROGEN ROAST-HYDROMETALLURGICAL TECHNQUE. *Bureau of Mines, RI 8067, 21p., 1975. 12 refs.*

A method of processing chalcopyrite concentrates for copper recover is described that avoids the generation of large quantities of sulfur dioxide associated with prior art high-temperature air-roasting and air-smelting processes. The process combines a preliminary inert gas roast with a two-stage leach plus electrowinning. The principal steps consist of the following: inert gas roasting to convert the chalcopyrite to sulfur-deficient chalcopyrite, troilite, and a boronitelike structure; hydrochloric acid leaching to remove most of the iron; dissolution of the copper-bearing residue in an oxidizing spent electrolyte; and electrowinning. The products are high-purity copper, elemental sulfur, iron oxide, and a silica residue containing gold, silver, and molybdenum. Sulfur is recovered from the inert gas roasting and second-stage leach processes by method which is based on the wide variation in the solubility of sulfur in perchloroethylene wit temperature.

55763

APTIC NO. 80617

Gallagher, Patrick K., David W. Johnson, Jr., and Eva M. Vogel

EXAMPLES OF THE USE OF DTA FOR THE STUDY OF CATALYTIC ACTIVITY AND RELATED PHENOMENA. *Preprint, Bell Labs., Murray Hill, N. J., 38p., 1975. 12 refs. (Presented at the Catalysis in Organic Synthesis Conference, 5th, Boston, Mass., April 1975.)*

Differential thermal analysis was used to study the activity of oxidation catalysts suitable for controlling carbon monoxide emissions from motor vehicles. A close correlation between the results obtained with differential thermal analysis and those obtained with more conventional reactor studies was observed. The poisoning effect of sulfur dioxide on oxide catalysts was readily detected by the thermal analysis, and small additions of platinum were shown to be beneficial in resisting SO2 poisoning. (Author conclusions modified)

55764

APTIC NO. 80992

Geiringer, Stefan L.

POWER GENERATION AT THE HARVARD MEDICAL COMPLEX USING SOLID WASTE. *Geiringer Paul L.) and Assoc., New York, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 85-90. (Nov. 3-5.)*

Air pollution control for power generation at the Harvard Medical complex is described. In the incinerator heat recovery system at the complex, the exhaust gases from the firebrick incinerator are used as combustion air in the water tube boilers. The gases, after leaving the firebrick incinerator, pass through a waste heat boiler which reduces their temperature to approximately 205 C. A mechanical dust collector extracts a large portion of the fly ash before the gases enter the forced draft fan of the main power boilers. The exhaust gases from the incinerator are directed to any one of a number of boilers rather than having the combustion of refuse restricted to specially designed watertube units. The power plant is especially efficient in flue economy, generating electricity with a net heat rate of about 5200 Btu/kwh. This heat rate results in a 10,000 gallon/year fuel saving. All of the refuse from the hospital complex will be pneumatically conveyed to the plant for incineration. This system is described.

55765

APTIC NO. 80512

Genco, J. M., H. S. Rosenberg, M. Y. Anastas, E. C. Rosar, and J. M. Dulin

THE USE OF NAHCOLITE ORE AND BAG FILTERS FOR SULFUR DIOXIDE EMISSION CONTROL. *J. Air Pollution Control Assoc., 25(12): 1244-1253, Dec. 1975. 15 refs.*

The nahcolite ore injection process for the simultaneous removal of fly ash and sulfur oxides from stack gases is described. The process is capable of removing greater than 99% of the particulate matter and greater than 70% of the sulfur oxides present in such gases. The flue gas is drawn through a baghouse by induced draft fans and sent up to the stack. Most of the sulfur dioxide and practically all the fly ash is removed as the gas passes through the filter bags. The spent nahcolite ore and fly ash are collected and conveyed to waste disposal as landfill, or, alternatively, processed for insolubilization by coprecipitation prior to landfilling. The nahcolite ore injection process was comparable in cost to wet scrubbing for a southwestern power plant, and somewhat more expensive for a midwestern plant. (Author abstract modified)

55766

APTIC NO. 73541

Genslak, S. L. and J. A. Zahorchak

DUEL CATALYTIC CONVERTERS. *Preprint, Society of Automotive Engineers, Warrendale, Pa., 10p., 1975. 7 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750176.)*

Various automotive catalysts were tested for their ability to achieve the 1978 emissions limits for hydrocarbons, carbon monoxide, and nitrogen oxides. Dual-type systems employing oxidation and reduction catalysts appear capable of meeting the standards at low mileage under experimental conditions (Federal Test Procedure); the maximum mileage achieved while meeting the limits is only 12,000 mi, however. Such systems may result in poor fuel economy since additional spark retard is required to reduce hydrocarbons to the levels needed to achieve 50,000 mi durability. Generally, the systems are complex and require much more development to achieve emission levels and durability requirements for 1978 emission standards. (Author conclusions modified)

55767

APTIC NO. 80947

Ginsburg, Theo

A MATHEMATICAL MODEL FOR TECHNICAL RECYCLING. *ETH, Zurich (Switzerland), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 34-40. (Nov. 3-5.)*

A mathematical model for the technical recycling of resources was developed. The model shows that the energetic economy of each recycling process depends on the specific energy consumption both for the production of the original material and for the recycling process. Another important parameter is the value relation between additional energy use and the corresponding material recovery. It is meaningless to independently maximize the recycling efficiency without consideration of financial aspects, since the economically optimal point is reached long before the maximum efficiency.

55768 **APTIC NO. 75949**

Gooch, John P. and Joseph D. McCain

PARTICULATE COLLECTION EFFICIENCY MEASUREMENTS ON A WET ELECTROSTATIC PRECIPITATOR. *Kellogg (M. W.) Co., Houston, Tex., Environmental Protection Agency Contract 68-02-1308, Task 21, Program Element 1AB012, ROAP 21ADL-004, Rept. EPA-650/2-75-033, 6p., March 1975. 6 refs.*

NTIS: PB 244173/AS

Fractional and overall particulate collection efficiency measurements were made on a plate type wet electrostatic precipitator collecting fume from an aluminum pot line. Overall collection efficiency determinations, based on a mass train with an instack filter, ranged from 95.0 to 98.0%. The mass filter obtained much higher total outlet mass loadings than did the Andersen impactors, presumably because of large entrained liquor droplets which were captured by the mass traverse, but not by the single point impactor measurements. The average minimum collection efficiency in the size range 0.2 to 1.0 micron diameter, based on the Andersen data, was 98.5%. Comparisons between collection efficiencies measured with Andersen impactors and predicted with a mathematical model of an electrostatic precipitator indicated fair agreement in the size range from 0.2 to about 1.3 micron. The relationship of collection efficiency to particle size departed drastically from the expected pattern, for larger particles, possibly because of liquor carryover from the electrode irrigation system. (Author abstract)

55769 **APTIC NO. 80522**

Haastert, H. P., W. Meichsner, H. Rellermeyer, and K. Peters

OPERATIONAL ASPECTS OF THE INJECTION PROCESS FOR DESULFURIZATION OF HOT METAL. *Iron Steel Eng., 52(10):71-77, Oct. 1975. 21 refs.*

A process for the injection of calcium carbide based mixtures for mass desulfurization of hot metal is described. It consists of injecting powdered desulfurizing material pneumatically into the hot metal by means of a submerged lance. This lance is a normal pipe coated with a thin layer of ceramic material. The desulfurizing agent is a mixture of calcium carbide with gas evolving components which provide the necessary stirring of the hot metal. The injection time for a 250 ton torpedo ladle takes 8 min. The ladle can be filled up to about 95% of capacity. Advantages of the concept are the flexibility and reliability of the operation and the noninterference with the cast house and the steelmaking shop.

55770 **APTIC NO. 73430**

Hachiya, Tomoyoshi, Koichi Honda, and Masahiko Takeda

REACTION BETWEEN METAL SALTS OF AMINO ACID AND NITRIC OXIDE. *(Amino san kinzoku en to issanka chisso no hanno). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 802, 1975. (Presented at the Japan Chemical Society, Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2008.)*

Reactions of metal salts of amino acids and nitric oxide were carried out as a possible treatment method for NO. Monosodium glutamate (0.2 mol) and ferric sulfate heptahydrate (0.1 mol) were dissolved in 200 ml water and, after degassing, NO was introduced. Analysis of the resulting gas by gas chromatography revealed that it contained mostly nitrous oxide. Results indicated 0.5 mol of N_2O was formed from 1 mol of NO and iron as Fe(II) was oxidized to Fe(III). Similar results were obtained with ferric salts of aspartic acid and pyrrolidonecarboxylic acid. Two 27 mm by 400 mm glass columns each were filled with 100 ml of 1 mol/l ferric glutamate solution and helium gas containing 9700 ppm NO was introduced at 1-1.2 l/min. The NO removal efficiency was 87-95% for the first column for the first 220 l of gas and 94-98% for the second column.

55771 **APTIC NO. 80708**

Haines, John A.

AIR POLLUTION FROM ENERGY PRODUCTION AND USE. *Clean Air (J. Clean Air Soc. Australia New Zealand), 9(3):49-55, Aug. 1975. 13 refs. (Presented at the International Clean Air Conference, Rotorua, New Zealand, Feb. 1975.)*

The air pollution problems of sulfur oxides and particulate matter arising from fuel combustion in stationary sources within the Organisation for Economic Cooperation and Development is discussed. The nature and relative importance of the problem of air pollution from fuel combustion varies between and within countries and leads to different national control policies and priorities. The intensity of the problem depends to a large extent on both the physical and socioeconomic aspects of a region. Geography and climate are important factors in relation to local conditions. For similar air pollution emission patterns, topography and meso-meteorology have a major influence on ambient concentrations. The extent of urbanization and industrialization as well as the local energy supply patterns are key factors influencing the overall impact of the problem in any particular area. Heavy dependence on high sulfur Middle East oil in Japan and on high S Eastern coals in some parts of the United States results in a more serious local air pollution problem than in countries such as Norway which have an abundant supply of clean hydroelectric energy.

55772 **APTIC NO. 80988**

Hamabe, I., T. Tsugeno, and S. Nozu

PYROLYZING TEST OF MUNICIPAL WASTE IN JAPAN. *Kawaski Heavy Industries, Ltd., Kobe (Japan), Environment and Resources System Engineering Center, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 243-249. (Nov. 3-5.)*

The waste composition at a 30 ton/day pilot plant for pyrolyzing municipal waste in Japan is described. Residue is composed of carbon and incombustibles such as metals, earth, glass, and ash. Total C is 3.9-11.2%. The waste gas volume of this system is about half what it would be for an incineration process; the emissions of hydrogen chloride and sulfur oxides as well as nitrogen oxides are less than half of those by the incineration process. Dust concental is achieved without using electrostatic precipitators.

55773 **APTIC NO. 73350**

Handa, Takashi, Sadayoshi Matsushita, Masahiro Morita, Takashi Hashimoto, Takaki Yamamura, Masahiko Okaniwa, and Shoichiro Saito

STUDIES ON AUTOMOBILE EXHAUST GAS COMPONENTS, PART 1, RUNNING STATE AND EXHAUST COMPONENTS. *(Jidosha haiki gasu seibun ni tsuite no kenkyu, 1, sokojotai to haiki gasu seibun). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 804, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2010.)*

The conditions of engine combustion of the 1971 Nissan Bluebird N510 (1428 cc) was tested on a dynamometer for intake pressure, speed, power, gasoline consumption, hydrocarbons emission, nitrogen oxides emission, carbon monoxide emission, carbon dioxide emission, and air to fuel ratio. The tested conditions are mainly on the running state which are 40 to 80 km/hr. The hydrocarbons emission decreased with increased air to fuel ratio: it was 350 ppm at a ratio of 11 and decreased to 260 ppm at 15 for a running speed of 40 km/hr. The CO emission also decreased with increased air to fuel ratio. The CO emission reached nearly 0% at an air to fuel ratio of 15 while it was 5% at 12. Both NO_x and CO_2 increased with the increased air to fuel ratio, and they were 1511 ppm and 14% respectively at a ratio around 15. Their levels at the ratio 12 were 500 ppm and 12% respectively. A linear correlation was observed between the NO_x and CO emissions.

55774 **APTIC NO. 73380**

Harada, Tetsuya and Ryo Terao

A RECIRCULATING DEVICE FOR EXHAUST GAS. *(Haikigasu kanryu sochi). Text in Japanese. (Nissan Motor Co., Ltd., Yokohama (Japan)) Japan. Model Util. Sho 50-4897. 2p., Feb. 10, 1975. (Appl. Aug. 13, 1971, 1 claim).*

A recirculation device for automobile exhaust gas equipped with a catalytic converter is described. A pipe bypassing the catalytic converter is installed to prevent hot exhaust gas recirculation. The bypassing pipe equips a premuffler with a recirculation pipe is attached at the upper stream of the premuffler and a valve controlling the flow direction (either to the bypassing pipe or main exhaust pipe) of exhaust gas is located at further upper stream of the recirculation pipe fitting. When the catalytic converter is not at high temperature, the flow control valve is in the closed position to block the gas flowing the premuffler. Therefore the exhaust gas flows through the catalytic converter and is discharged into the atmosphere. However, some of the exhaust gas flows through the premuffler after passing the catalytic converter and is recirculated. The premuffler serves to cool down the exhaust gas heated by the catalytic reactions.

55775 **APTIC NO. 73596**

Harrison, W. B.

CAN FUEL PROCESSING COMPETE WITH FLUE GAS PROCESSING? *Preprint, American Society of Mechanical Engineers, New York, 15p., 1975. (Presented at the American Society of Mechanical Engineers, Air Pollution Division, National Symposium, 4th, St. Louis, Mo., March 24-25, 1975.)*

Factors affecting the choice between fuel processing (coal gasification, liquefaction, and solvent refining) and flue gas processing (scrubbing and dry adsorption) are outlined. Sulfur removed during gasification, liquefaction, or solvent refining may leave the process either as concentrated sulfuric acid or elemental sulfur, with the choice being dependent on the potential markets that exist for either form. On the other hand, in stack gas processing the chemical form of sulfur is dictated by the nature of the process. In terms of transportation costs, solvent refining and liquefaction are capable of offering large savings over gasification. Flue gas processing creates additional transportation expenses in comparison since large quantities of processing materials must be shipped into the power plant site. Many existing plants, however, do not have space available for gasification facilities. Solvent refining or coal liquefaction, in contrast, can be accommodated with very small modifications to the plant. Another factor for consideration is the interaction of the alternatives on the operations of the power plant itself. Flue gas processing, for example, requires additional skills of the power plant operating staff. It appears that it is too soon to answer the question of whether fuel processing can compete with flue gas processing, and the answer may be different for different plants.

55776 **APTIC NO. 80801**

Hattori, Hisao

ON THE RECENT ABATEMENT TECHNOLOGY FOR NOX. *(Saikin no NOx boshi gijutsu ni tsuite). Text in Japanese. Nikkakyo Geppo (Mon. Bull. Jap. Chem. Ind. Assoc.), 28(9):482-499, Sept. 1975.*

The present status of nitrogen oxides abatement technology was reviewed with reference to NOx environmental standards and emission standards. Control of NOx by combustion modification is reviewed, including studies on the relationship between fuel type and NOx emission concentration, comparison of exhaust gas recirculation and two-stage combustion, NOx concentration and dust concentration, boiler structure and boiler efficiency, low NOx burner and NOx emission by micro- powder carbon combustion. The dry-type flue gas denitrification methods, including ammonia catalytic reduction, recently developed catalytic reduction methods using an iron-type catalyst, and non-catalytic NH3 reduction are reviewed with a discussion of problems and equipment and running costs. The wet oxidation- reduction method and absorption method are reviewed, with discussion of problems and equipment and running costs.

55777 **APTIC NO. 80910**

Henne, R. and E. M. Knoernschild

THERMIONIC SUPERIMPOSED STAGES FOR STEAM POWER PLANTS. *(Thermionische Vorschaltstufen fuer Dampfkraftwerke). Text in German. VDI (Ver. Deut. Ingr.) Ber., (236):117-124, 1975. 4 refs.*

The principle and possible uses of thermionic energy conversion units, suitable for the direct conversion of thermal energy into electricity, are presented in the light of recent developments. It was recently possible to reduce the working temperature from about 1600 C to 1250 C and to increase the efficiency from 10 to about 15% at the same time. A further reduction of the temperature to about 1000-1100 C with a simultaneous increase in the efficiency [illegible] 25% is expected in the near future. As the thermionic converters generate waste heat in a temperature range of 500-600 C, they are especially suitable as a topping stage for conventional steam power plants which thus utilize the waste heat of these converters. Such integrated systems are expected to have an overall thermal efficiency of 50-60%, which would result in a corresponding reduction of the fuel consumption and of the waste heat and air pollutants discharged into the atmosphere.

55778 **APTIC NO. 80720**

Hippel, Frank von and Robert H. Williams

SOLAR TECHNOLOGIES. *Bull. At. Sci., 31(9):25-31, Nov. 1975. 17 refs.*

The air pollution problems associated with solar energy conversion are discussed. An ocean thermal gradient scheme could cause a net transfer to surface waters of inorganic carbon from the carbon enriched bottom waters. Most of the excess carbon would pass into the atmosphere as carbon dioxide. Converting sunlight to electricity with photocells at a space station in geosynchronous orbit would involve at least two space shuttle flights/day. Over 100 ton of chlorine would be dumped directly into the stratosphere as hydrochloric acid from each shuttle flight. Photosynthesis is an attractive solar energy conversion process because, unlike fossil fuels, plant material does not lead to a net atmospheric buildup of carbon dioxide and the climatic consequences. Photosynthesis is the least efficient solar conversion system with only a 5-6% maximum net efficiency.

55779 **APTIC NO. 73298**

Horiba, Minoru

A SOOT AND SMOKE CLARIFIER. *(Baien seijo sochi). Text in Japanese. (Assignee not given.) Japan. Model Util. Sho 50-7580. 3p., March 6, 1975. (Appl. March 6, 1971, 1 claim).*

A removal apparatus for soot and dusts from flue gas is described. The apparatus has two separate water showers and a turbulent fan and three shielding plates are employed to produce a zigzag flow of flue gas within the apparatus. The flue gas enters from the top of the apparatus and flows through the first water shower at which large soot and dusts are removed; then it flows upward to a second water shower located at the top. The water stream of the second shower thus washes the flue gas countercurrently and a turbulent fan is located just under the shower, which allows the sprayed water to scatter. The flue gas then changes its flowing direction downwardly again and is discharged from the top of the apparatus after passing around the last shielding plate. The apparatus also serves as a cooler of flue gas. The apparatus can be built cheaply and installed either indoors or outdoors. The use of two separate showers and turbulent fan effectively removes soot and dusts of various sizes from flue gases.

CONTROL METHODS

55780

APTIC NO. 80946

Humber, Nicholas

ENERGY RECOVERY IN THE UNITED STATES STATUS OF IMPLEMENTATIONS. *Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 143-148. (Nov. 3-5.)*

The properties of fuels derived from municipal solid wastes are described. A liquid oil-like fuel, produced from solid waste through pyrolysis, could be used as a supplement to no. 6 fuel in large industrial or utility boilers. Most gaseous fuels produced from solid waste have a lower heating value than natural gas because they contain significant quantities of carbon dioxide and nitrogen. The transportation distance is limited by the cost of compressing and pumping the gas.

55781

APTIC NO. 80844

Hurn, R. W., J. R. Allsup, and B. H. Eccleston

CHARACTERISTICS OF METHANOL AS INTERNAL COMBUSTION ENGINE FUEL. *Prepriut, Energy Research and Development Administration, Bartlesville, Okla., Bartlesville Energy Research Center, 5p., 1975. (Presented at the Intersociety Energy Conversion Engineering Conference, 10th, Newark, Del., Aug. 17-22, 1975.)*

The physical and combustion characteristics of methanol/gasoline blends were studied. Phase separation data were obtained for a number of gasolines blended with methanol in concentrations to 30% by weight. Gasolines and gasoline components that are widely different in hydrocarbon composition were used to explore the dependence of methanol/gasoline/water miscibility on composition as a guide to the selection of appropriate base fuels. Typical water tolerance data are reported. Low boiling aromatic components of gasoline were found to increase miscibility while the paraffin components were found to decrease miscibility. The combustion characteristics studied include exhaust emissions and fuel economy data from six 1974 and 1975 model test vehicles operating at 20 F, 75 F, and 100 F ambient temperature with methanol concentrations of 0, 5, and 10%. The test vehicles were tuned to factory specifications and not optimized for methanol operation. Exhaust emissions measured included unburned methanol and aldehydes. (Author abstract modified)

55782

APTIC NO. 73316

Iida, Hirofumi

NOX REDUCTION MEASURES IN BOILERS BY FUEL CONVERSION AND COMBUSTION MODIFICATION. *(Boira ni okeru nenryo tankan oyobi nensho shusei no yoru NOx teigen taisaku). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(1):15-34, Jan. 1975. 11 refs.*

Ways of reducing nitrogen oxides emissions in boilers are surveyed. Countermeasures include conversion to better-quality fuel; modifications in combustion procedures (two-stage combustion; off-stoichiometric combustion; exhaust gas recirculation combustion; water or steam injection); modifications in combustion conditions (combustion with slight excess of air; lowering of preheat temperature; modification in size of air register opening; lowering of combustion load ratio); and use of low NOx emission burners. The effectiveness of countermeasures varies with boiler size. For example, fuel upgrading is effective for all boiler sizes; exhaust gas recirculation combustion is useful only for large boilers. Boiler heat transfer areas can vary from 40-100 sq m for small boilers, 40-400 sq m for medium boilers, and over 400-500 sq m for large boilers.

55783

APTIC NO. 80803

Iida, Hirofumi and Kazushi Watanabe

FUEL-BURNING EQUIPMENT EMITTING LOW NITROGEN OXIDES. *(Chisso sankabutsu tei hassei nensho sochi). Text in Japanese. (Tokyo Gas Co., Ltd. Japan)) Japan. Model Util. Sho 50-28408. 2p., Aug. 22, 1975. 1 ref. (Appl. Dec. 26, 1970, claims not given). F*

Fuel combustion equipment which emits lwoer nitrogen oxides is described. The high load combustion chamber within the furnace has a nozzle. A cone-shaped combustion gas guide cylinder is attached to the nozzle; there is a small space between the two. As the combustion gas passes through the nozzle toward the guide cylinder, the low pressure produced sucks the air within the furnace that is mixed within the guide cylinder. Since the combusted gas immediately emerges at the nozzle plant and is mixed with cooler air within the furnace, the temperature of the combusted gas drops immediately after combustion; thus the formation of nitrogen oxides can be reduced.

55784

APTIC NO. 73312

Imanishi, Hideharu

PRESENT STATUS OF AND PROBLEMS IN ENVIRONMENTAL PROTECTION MEASURES IN THERMAL POWER PLANTS. *(Karyoku hatsudensho ni okeru kankyo hozen taisaku no genjo to mondaiten ni tsuite). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Control, Japan), 28(90):19-26, Jan. 1975.*

Countermeasures for atmospheric pollution (dust, sulfur oxides, nitrogen oxides) from thermal power plants are described, and problems specific to thermal power plants are discussed. Use of low-grade coal may impose technological limitations on the effectiveness of dust collection measures. Problems arise when a relatively slight amount of sulfur oxides must be removed from a large amount of exhaust gas. Also, desulfurization installations must be compatible with the high degree of automation in thermal power plants. Control of nitrogen oxides depends on recognition of mode of formation: fuel nitric oxide or thermal NO. Fuel NO is formed independently of temperature, whereas thermal NO formation varies directly with temperature. Another problem lies in the formation of usable innocuous by-products. Power plants are not able to utilize by-products of pollution control by recycling. Consequently, by-products must have commercial value, or present no secondary pollution problems upon disposal.

55785

APTIC NO. 75947

Isaacs, Gerald A. and Fouad K. Zada

SURVEY OF FLUE GAS DESULFURIZATION SYSTEMS CHOLLA POWER GENERATING STATION, ARIZONA PUBLIC SERVICE COMPANY. *PEDCo- Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1321, Task 6a, Program Element 1AB013, Rept. EPA-650/2-75-057-a, 63p., June 1975.*

NTIS: PB 244141/AS

Results are given of a survey of a wet limestone system for desulfurization of flue gas on an electric generating station. The generating unit has a maximum continuous net generating capacity of 115 MW. The boiler burns 54 tons of pulverized coal/hr at capacity. The typical gross heat content of the coal, as received, is 10 290 Btu/lb; typical ash and sulfur contents are 10.4 and 0.55%, respectively. The system consists of two parallel scrubbing train modules, each accommodating 50% of the flue gas. Both modules include an adjustable flooded disc scrubber for particulate control, followed by a tower. One tower is packed, utilizing a limestone slurry for sulfur dioxide removal. The other contains no packing, and limestone is not circulated through it. Its SO2 removal efficiency is estimated at 25%. The system operates in an open loop mode, since there is no recycling of liquor from the fly ash pond. Approximately 386 gallons of makeup water are required for each lb-mole of SO2 removed. Cost estimates are given.

55786

APTIC NO. 80934

Ishiguro, Tatsukichi

OFFENSIVE ODOR PREVENTIVE MEASURES AT THE DEAD ANIMALS PROCESSING PLANTS. ITS

PROBLEMS AND DEODORIZING METHOD. (Heijyu shori shisetsu no akushu boshi taisaku. Sono mondaiten to dashu hoho). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 20(11):35-44, Nov. 1975. 4 refs.

Methods used for the prevention of odors at animal processing plants, which include leather processing plants, waste treatment plants, blood processing plants, fish waste treatment plants, poultry waste treatment plants and stray dog disposal plants are discussed. Existing environmental problems are traceable to a lack of funds, primitive facilities, a shortage of labor, unstable product costs, and a poor attitude on the part of plant owners. Prevention and deodorization policies are discussed. Examples of fish meal processing plants in Sweden, animal wastes and fat processing plants in the U. S. and Europe, and fish waste and animal waste treatment systems in Shioyama (Yamanashi) are given.

55787 **APTIC NO. 73453**

Ishihara, Yoshimi, Chuhei Asakawa, and Hisashi Hukuzawa

STUDIES ON SULFUR OXIDES REMOVAL FROM FLUE GAS BY DRY LIMESTONE INJECTION PROCESS, PART II, EFFECTS OF REACTION CONDITIONS ON SULFUR OXIDES. *(Sekkaiseki fukikomiho ni yoru haien datsuryu no kenkyu, II, sekkaiseki fukikomiho no datsuryuritsu ni oyobosu shohanno joken no eikyo). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan (Tokyo)), 54(575):175, 1975. 11 refs.*

The effect on desulfurization efficiency in the limestone injection method of sulfur dioxide concentration, amount of injected limestone, type of injected limestone, and furnace temperature was studied using simulated desulfurization equipment. Limestone powder was injected into a furnace that combust an SO2 mixed fuel, and an SO2 analyzer was used to determine the SO2 level of the treated flue gas. The desulfurization efficiency increased proportionally to the amount of injected limestone. The SO2 removal was 10% without the addition of limestone, which was due to SO2 adsorption to the reaction tower, but 40% SO2 was removed when 150% of stoichiometric amount of limestone in 12 micron particle size was injected, and the SO2 removal efficiency improved to 55% with the use of 2.7 micron particle sized limestone. Higher porosity limestone (with increased surface area) increased the SO2 removal. The SO2 removal decreased with the one fourth to one third power of particle size of limestone. Limestone with higher ferric oxide content tended to remove more SO2 than limestone with less ferric oxide content. No difference in desulfurization efficiency was observed with furnace temperatures between 900 to 1200 C. The desulfurization efficiency by the same type and quantity of limestone increased proportionally with the 0.3 to 0.5 power of SO2 concentration.

55788 **APTIC NO. 88570**

Ishihara, Yoshimi and Hisashi Hukuzawa

STUDIES ON SULFUR OXIDES REMOVAL FROM FLUE GAS BY DRY LIMESTONE INJECTION PROCESSES (III) -- DISCUSSIONS ON THE EFFECT OF FACTORS AFFECTING THE REACTION RATE OF SULFUR DIOXIDE WITH LIMESTONE PARTICLES INJECTED -- INTO COMBUSTION GAS. *Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan) (Tokyo), 54(5):321-331, 1975. 18 refs.*

Variation of the reaction rates of sulfur oxide with calcium oxide particles in combustion gas under different reaction conditions is discussed. Higher reaction rates were obtained at the beginning of the reactions when the limestone was injected into the combustion gases but the decrease of the reaction rates was more rapid as the reactions progressed. The Tokunoshima limestone had highest calcium oxide utilization due to the smaller decrease of the reaction rate compared with the other limestones. The activity of the calcium oxide in reaction with sulfur dioxide may depend on the surface area and the defects in the calcium oxide lattice. The surface area of limestone particles is the sum of those of the particles. The increase of the surface area by calcination means the increase of internal surface area of the particles. The internal surface area of the particles decreases with the progress of the reaction with sulfur dioxide. The higher decreasing tendencies are obtained by decreasing the particle size of calcium oxide. (Author abstract)

55789 **APTIC NO. 73343**

Ito, Takusen, Noboru Okigami, Kenji Onose, and Takayoshi Ueda

AN INCINERATOR FOR COMBUSTIBLE WASTE GAS. *(Kanensei haikigasu no nensho shori sochi). Text in Japanese. (Hitachi Shipbuilding and Engineering Co., Ltd., Osaka (Japan)) Japan. Model Util. Sho 50-7752. 3p., March 7, 1975. (Appl. Nov. 22, 1971, 1 claim).*

An incinerator for combustible waste gas is described. The flue gas containing combustible gases is split into three lines, each of which is bubbled through an independent water bath, however, each line is dipped to a different depth from the water level, thus different pressures appear at the end of each line. Whenever higher flue gas pressure (larger flue gas emission) results, the flue gas emerges into the water bath. The bubbled flue gas is then taken to a combustion furnace through a pipe whose tip is located next to a pilot light to ignite the combustible flue gas. The ignition system is installed for each pipe from the three independent water baths. When the flue gas is at low pressure, only the system which has smaller pressure operates; all three systems operate whenever the flue gas pressure is high. The apparatus can, therefore, prevent accidents caused by a variable emission rate of flue gas, since the gas flow at individual combustion points is regulated fairly constantly. Highly constant gas flow could even be obtained if more than three splitting lines for the flue gas were employed.

55790 **APTIC NO. 73429**

Iwata, Yasuhiro, Takai Nakayama, and Hiroaki Watanabe

A WATER-TAKING OUT DEVICE FOR EXHAUST RECIRCULATOR. *(Haiki kanryusochi yo mizu nuki sochi). Text in Japanese. (Nissan Motor Co., Ltd. (Japan)) Japan. Model Util. Sho 50-4898. 3p., Feb. 10, 1975. (Appl. Dec. 2, 1971, 1 claim).*

A water removal device for exhaust recirculators aiming at preventing damage of carbon filters by counterflow high temperature gas is described. A water removing pipe is connected at one end to the exhaust pipe before the pre-muffler. The other end of the water removing pipe penetrates into the cylindrical bottom part of the container of the carbon filter. A cup-type cover is fixed to the container to keep the water level at the same height as the water removing pipe. The water prevents the counterflow hot gas from entering the carbon filter without being cooled by the cooler.

55791 **APTIC NO. 89843**

Jahnig, C. E. and R. R. Bertrand

ENVIRONMENTAL ASPECTS OF COAL GASIFICATION. *Preprint, American Inst. of Chemical Engineers, New York, 24p., 1975. 20 refs. (Presented at the American Institute of Chemical Engineers, Meeting Boston, Mass., Sept. 8, 1975.)*

Attempts are being made to augment the restricted supplies of fuel, while at the same time controlling environmental impact. A number of large plants are planned for converting coal to synthetic natural gas. A generalized or typical gasification operation based on steam and oxygen has been developed to use as a basis for further discussion. Specific areas of concern relating to emissions of solids, liquids, gases, and trace elements are shown in tabular form. While stack gas cleanup can take care of sulfur in the flue gas from furnaces, the carbon dioxide vent stream from acid gas removal in some operating plants and projected plants is unsatisfactorily high in sulfur

and combustibles. Waste water and trace metals are also discussed. A typical gasification operation is discussed, including environmental concerns, stoichiometry for gasification, flow rates, sulfur balance, sour water, and trace elements. Some of the factors affecting selection of environmental controls are discussed, including cooling and scrubbing, water cleanup, acid gas removal, solids disposal, and trace elements.

55792 **APTIC NO. 80747**

Jones, John F.

CLEAN FUELS FROM COAL FOR POWER GENERATION. *Energy Sources, 2(2):179-202, 1975. 16 refs. (Presented at the American Chemical Society Storch Award Symposium, Atlantic City, N. J., Sept. 11, 1974.)*

The technology of the Char-Oil Energy Development (COED) project that produces clean fuels from coal for power generation is described. The COED process converts coal to synthetic crude oil, gas, and char. The uniqueness of the process lies in its ability to process continuously agglomerating coals without preoxidation of the coal. Preoxidation of a coal reduces the yield of useful products, mainly oil, on subsequent pyrolysis. The continuous processing is accomplished by a series of multiple reactors of fluidized beds. The vapors are quenched directly with water to condense the oil. It contains the unwanted elements of nitrogen, sulfur, and oxygen. The gas produced from pyrolysis has a heating value of 500 BTU/scf after the carbon dioxide and hydrogen sulfide are scrubbed out. The char contains the same percentage of S as the coal from which it is derived. The char is essentially carbon and ash, and it does not give off tar during gasification. In a COED plant with added char gasification, over 05% of the S in the coal is recovered as elemental S. About 4.5% of the S exists with the ash, and less than 0.5% of the S is emitted to the air as SO2.

55793 **APTIC NO. 81025**

Kabsch, Piotr

TWO-STEP WET-TYPE DUST SEPARATOR MODEL ZOA-1. *(Dwustopniowy odpylacz mokry ZOA-1). Text in Polish. Ochrona Powietrza, 49(5):135-142, Oct. 1975.*

Wet-type collectors, used industrially in ever increasing numbers, are unique in permitting simultaneous dust removal, defogging, sorption of harmful gases, and complete elimination of secondary dust emissions. They require considerable amounts of energy and water, and their sewage is difficult to clean. New designs have been developed. A 2-step dust separator model is described. It consists of a cyclone with a rotating water ring and a venturi injector orifice with automatic closed circulation. It achieved a dust-separating efficiency in excess of 98% at a mean dust concentration in purified gas of 10 mg/cu nm. A study of the dust-collector model ZOA-1 showed its considerable range of action and very low water consumption. For reduced dust concentrations, reduced local flow resistance, lower flow intensity, and comparatively less water consumption at higher temperatures, the W2 version of the test models was superior. It was equipped with an axial droplet separator and a hydraulic sludge removal device for the circulating water, and displayed a better dust-separating effect because of the higher flow intensity and higher flow speed and the sprinkling intensity in the venturi orifices. The device was able to use cold water, due to better cooling on the outside of the droplet separator and the hydraulic sludge removal system. The prototype ZOA-1, for the separation of condensation dusts, operated with an approximate flow intensity of 2450/cu nm/hr; a dust separation efficiency of 2000-3000 cu nm/hr (arranged in batteries of 3-24 units); a flow resistance of 7.8 kN/cu m; an average unit consumption of water, gas temperatures up to 400 K, of 30 kg/1000 cu nm.

55794 **APTIC NO. 80741**

Kaijima, Totoo

MAINTENANCE OF ENVIRONMENTAL POLLUTION CONTROLLING FACILITIES. *(Kogai boshi setsubi no mentenansu). Text in Japanese. Puranto Enjinia (Plant Eng.), 7(12):81-85, Dec. 1975.*

The maintenance of environmental pollution is controlling facilities at the Kajima Petroleum and Refining Industries is described. Problems pertaining to maintenance of the exhaust gas desulfurization device of Mitsubishi Kakoki Kaisha, Ltd. are discussed and analyzed according to data obtained during the first 16 mo of operation of the device, which has a designed gas treating capacity of 28,000 N cu m/hr. The typical failures detected during daily maintenance work are classified as leakage, breakage, corrosion and clogging. Among these, failures traceable to breakage were most often due to the improper handling of the device. Other failures detected during logged maintenance work are: corrosion of the spray nozzles in the cooling tower; breakage of the carbide cooler, spalling in the large diameter FRP lines, corrosion of the tubes of the waste heat boiler and spalling of the lining of the oxidation reaction tank. Preventive maintenance measures for failures of the FRP, glass lined valves, and ducts is recommended.

55795 **APTIC NO. 73294**

Kajitani, S., K. Kaneko, K. Ito, and S. Fukasawa

STUDIES ON THE SPARK-IGNITION METHANOL ENGINE - (I) THE INFLUENCE OF SUPPLEMENTARY INJECTION TO THE COMBUSTION. *(Hibana tenka metanoru kikan ni kansuru kenkyu). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 17-25, 1975. (Presented at the Japan Society of Mechanical Engineers, Tokyo, Japan, April 1-3, 1975, Paper 725.)*

A Mitsubishi R-52 single cylinder, water cooled engine having a compression ratio of 8.71 m, maximum shaft output of 12.0 ps/5500 rpm, maximum shaft torque of 2.2 kg-m/2000 rpm, and maximum average effective pressure of 8.5 kg-m/2000 rpm was installed with an injection pump and injection nozzles. Methanol was used as the fuel with portions sprayed near the spark plug and the effects on engine characteristics and exhaust composition were studied. Exhaust gases were sampled about 50 cm from the exhaust valve, and nitric oxide, carbon monoxide, and carbon dioxide were analyzed by non-dispersive infrared, nitrogen dioxide by non-dispersive ultraviolet, and hydrocarbons by flame ionization detector. Results showed that NO was reduced from 80% to 90% by spraying parts of the methanol fuel near the spark plug, but HC and CO in the exhaust were increased, and Pme (kg/sq cm) and kcal/ps-hr were also reduced. Pme and kcal/ps-hr were increased by installing a shroud at the spark plug to disperse the fuel mist.

55796 **APTIC NO. 79928**

Kakishita, T.

DEVELOPMENT OF SIMULTANEOUS REMOVING APPARATUS FOR NOX AND SOX. *(NOx, SOx doji jyokyosochi no kaihatsu ni tsuite). Text in Japanese. Kagaku Keizai (Chem. Ind. Econ.), 22(11):60-66, Oct. 1975. 12 refs.*

The background and progress of the development of a simultaneous denitrification-desulfurization system are reviewed. A simultaneou denitrification-desulfurization system consisting of an electrostatic dust precipitator and a reaction tower with a carbon type catalyst where nitrogen oxides and sulfur oxides were reacted at 200-250 C by adding ammonia was developed by Unichika. The denitrification reaction mechanism (selective catalytic NH3 reduction), the desulfurization reaction mechanism, the catalyst regeneration reaction mechanism (by SOx desorption), and other characteristics of the system are described. Results of bench scal tests (150 N cu m/hr) indicated that a dentrification rate of above 95% was maintained for four days, while the initial 95% desulfurization rate was reduced to 90% in about 20 hours. A pilot plant of 1500 N cu m/hr scale, designed to maintain denitrification and desulfurization rates of above 90%, is under construction. The equipment and running costs are comparable to those of a single desulfurization system, and this system is applicable to exhaust ga from boilers, glass melting furnaces, steel coke and sintering furnaces, thermal cracking furnaces, and cement kilns.

55797 **APTIC NO. 80962**

Kasaoka, Shigeaki, Yusaku Sakata, Meiji Ito, and Masato Ikeda

REACTIONS OF SULFUR OXIDES WITH VARIOUS METAL OXIDES AND THERMAL DECOMPOSITION OF METAL SULFATE PRODUCTS TO METAL OXIDES. *(Kakushu kinzoku sankabutsu to iou sankabutsu no hanno narabini sono seisei ryusanen no netsubunkai ni yoru sankabutsu no saisei riyo). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 11:2010-2022, 1975. 18 refs.*

The sulfation of metal oxides and the thermal regeneration of metal sulfates to oxides were studied to obtain suitable dry adsorbents to remove sulfur oxides. The metal oxides used included cupric oxide, manganese sesquioxide, cobaltic cobaltous oxide, nickel monoxide, ferric oxide, aluminum oxide, chromic oxide, magnesium oxide, and zinc oxide, prepared from metal salts and sodium hydroxide, sodium carbonate, or ammonia solutions. The experiments were carried out using a thermobalance under atmospheric pressure and at 25 to 800 C together with X-ray diffraction analysis. The total gas flow rate was 600 N cu m/min for 100 to 200 mg of metal oxides. Also, the regeneration was studied in nitrogen or air stream at 650 to 800 C. Four compositions of metal oxides prepared from metal sulfates and NaOH at 70 to 100 C were selected to be suitable for sulfation and regeneration. Cupric oxide, Mn_2O_3, and Co_3O_4 act as adsorbents for SO_x, Fe_2O_3 as an oxidative catalyst for sulfur dioxide to sulfur trioxide, and Al_2O_3 as a carrier. (Author abstract modified)

55798 **APTIC NO. 73313**

Kawano, Katsuzo

PRESENT STATUS OF AND FUTURE PLANS FOR POLLUTION CONTROL FACILITIES AT MURORAN IRON FOUNDRY OF NIHON SEIKO. *(Nihon Seikosho Muroran Seisakusho no okeru kogai boshi taisaku shisetsu no genkyo to kongo no keikaku). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Control, Japan), 28(90):27-29, Jan. 1975.*

Pollution control facilities at Muroran, Japan Iron Foundry of Nihon Seiko are described. Air pollution sources (combustion by-products), water (waste water), and noise (rolling machine motor, steam hammer), were determined, and countermeasures were taken. Use of low-sulfur fuel, accompanied by continuous monitoring of sulfur oxides, dust collection installations, waste water treatment prior to discharge, and noise-alleviating installations enabled meeting of environmental standards. Greening of the environment by planting trees and bushes is being conducted as well. Further pollution abatement installations are under consideration.

55799 **APTIC NO. 73426**

Kawasaki, Shozo

OPERATIONAL DATA ON DRY TYPE 200,000 N CU M/HR FLUE GAS DENITRIFICATION PROCESS AT SUMITOMO CHEMICAL INDUSTRIAL CO. *(Kanshiki 200,000 N cu m/hr kado deta, Sumitomo Kagaku Kogyo). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(2), 25, 1975.*

A flue gas denitrification facility using a catalytic ammonia method was developed by the Sumitomo Chemical Industrial Co. The theoretical molar ratio required for the reaction between ammonia and nitric oxide, if no nitrogen dioxide presence in the flue gas is assumed, is 0.67; however, the practical ratio was greater than 0.8. When the molar ratio exceeded 1.0, the unreacted ammonia level in the treated gas increased rapidly causing secondary pollution by ammonia. When a second catalyst to treat the unreacted ammonia was employed in addition to the primary catalyst for the denitrification, the ammonia level in the treated gas was less than 10 ppm and the second catalyst improved the overall denitrification efficiency by 5%. A 90% denitrification efficiency was obtained with flue gas containing 200 ppm nitrogen oxides and 7% oxygen and the system was able to treat 200,000 N cu m/hr of flue gas. The reaction temperature used was 300 C, and the two catalysts used in the process were not poisoned by the presence of sulfur dioxide.

55800 **APTIC NO. 80977**

Kelliher, W. J., R. Kobayashi, A. H. Howard, W. C. Stephens, M. DeMatteo, S. E. Standrod, and J. F. Milo

THE BOSTON NORTH SHORE SYSTEM - A CASE STUDY OF A MULTI-COMMUNITY, PRIVATELY FINANCED REFUSE DISPOSAL AND ENERGY RECOVERY SYSTEM. *City of Malden, Massachusetts, General Electric Co., Lynn, Mass., Utilities Operation, Wheelabrator Energy Systems, Inc., DeMatteo Construction Co., Rust Engineering Co., and RESCO Operations, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 513-524. 13 refs. (Nov. 3-5.)*

The basic features of the resource recovery facility and its energy and materials extraction subsystems at the Boston North Shore Refuse and Disposal and Energy Recovery System are described. The system employs two refuse-fired steam generators, with a combined average throughput of 1200 ton/day and a daily peak capacity of 1500 ton. Superheated steam is delivered to the General Electric Company at 625 psig, 825 F, at a maximum rate of 350,000 lb/hr. Particulates in the flue gas are extracted in electrostatic precipitators operating at an efficiency of over 99% to assure compliance with stringent local air pollution control regulations.

55801 **APTIC NO. 79916**

Kiessling, Francis J. and Eugene J. Stepko

CONSTRUCTION AND OPERATION OF STILL HIGH-CAPACITY COKE OVENS. *Iron Steel Engr., 52(11):38-43, Nov. 1975. 12 refs.*

Pollution control measures in the coking industry are discussed. The principal sources of emissions from coke ovens occur in the charging, the pushing, and the quenching operations. method of controlling pollution from all three of these sources was developed. Smokeless charging is accomplished through the use of a charging technique, which consists of a gravity flow butterfly control, of the use of a screw feed charging car. Either of these systems can be used in conjunction with stage charging and double collector mains, as the most satisfactory method of controlling charging emissions presently available. Pushing emissions can be controlled through the use of the hot coke container car. The container car mates with an enclosed coke guide, so that particulates from the pushing cycle are contained. A wet scrubber included on the transfer car removes the particulate matter before venting steam to the atmosphere. Quenching emissions are controlle by transferring the hot coke from the container car into a conventional quenching car in an enclosed area, or by transferring the hot coke into an enclosed bin from which the coke is fed to a continuous quencher.

55802 **APTIC NO. 73390**

Kio, Toshiro

ENVIRONMENTAL PROTECTION MEASURES AT HOKKAIDO OIL REFINERY OF IDEMITSU KOSAN. *(Idemitsu Kosan Hokkaido Seiyusho no kankyo hozen taisaku). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Control, Japan), 28(90):32-36, Jan. 1975.*

Pollution countermeasures at Tomakomai, Hokkaido Oil Refinery, Japan, of Idemitsu Kosan are described. This oil refinery is situated north of the other oil refineries in Japan. The oil refining capacity at present is 70,000 barrels/day, but projected final capacity is 300,000 barrels/day. An environmental management section has been set up within the company to oversee pollution problems. Areas of environmental concern include: efficient treatment of gas and water at one location; use of active carbon adsorption to treat waste water; installation of best possible equipment to combat ocean oil spillage and fires (oil fence, oil catcher, neutralizer, ballast treatment tank, disaster patrol ship); and paying attention to greening of factory grounds to provide a parklike atmosphere to the oil refinery. (Some 25,000 units of trees and other vegetation have been planted with success. However, soil had to be imported, and a large-scale protective screen against Pacific Ocean salt and winds had to be installed.) A telemeter monitoring system in Tomakomai City communicates hourly atmospheric pollution levels in the city to the refinery. Use of low-sulfur fuel and high chimneys are effective in reducing concentrations of sulfur oxides. Hydrocarbon and nitrogen oxide levels are lower than figures set by pollutant standards. Anti-noise measures are also under consideration.

55803 **APTIC NO. 80950**

Kirov, N. Y.

THE SAMPLING CHARACTERIZATION AND ASSESSMENT OF SOLID WASTES AS A FUEL. *New South Wales Univ., Sydney (Australia), Dept. of Fuel Technology, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, 6p. 4 refs. (Nov. 3-5.)*

The characteristics of solid wastes that are necessary for the successful conversion of refuse to energy are discussed. The parameters of importance to incinerator design in relation to handling, storage, combustion characteristics, maintenance, plant availability, and air pollution potential include: total weight, bulk density, moisture, calorific value, proximate and ultimate analyses, size distribution, ash fusion characteristics, and the presence of any undesirable elements, such as metals (mercury, arsenic, lead, tin, aluminum, and zinc), sulfur, chlorine, fluorine, phosphorus, nitrogeneous wastes and alkalis which may cause fouling, slagging, corrosion, or air pollution problems.

55804 **APTIC NO. 80940**

Kitako, Y. and H. Sueyoshi

CONVERSION OF WASTE POLYMER TO FUEL OIL. *Mitsui Shipbuilding and Engineering Co., Ltd., Ichihara (Japan) and Mitsui Petrochemical Industries, Ltd., Tokyo (Japan), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st. Montreux, Switzerland, 1975, p. 555-560. (Nov. 3-5.)*

The conversion of a waste polymer of polyethylene, low polymer (LP) to fuel oil by thermal cracking is discussed. Low polymer is a solid white material at atmospheric temperature, and when heated to 100 C or higher it melts into a viscous liquid, which is pumpable. As with polyethylene products, LP is composed of hydrocarbons, containing a small amount of ash due to residual catalysts. The decomposition rate largely depends on the reaction temperature. The quantity of cracked gas discharged from the vent condenser accounts for 4-5% of the raw material LP. The gas consists of hydrogen and hydrocarbons in the C1-C4 range.

55805 **APTIC NO. 79959**

Kitayama, Teruhide

SELECTION OF ODOR-REMOVING EQUIPMENT IN MALODOR CONTROL MEASURES, AND ACCOMPANYING CONDITIONS (PART 2). *(Akushu bojo taisaku ni oker jokyo sochi no sentei to, sore ni fuzui suru joken (Sono 2)). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 4(21):33-40, July 1975. 3 refs.*

The use of activated carbon in malodor removal is discussed. Adsorption systems are attractive to smaller enterprises, caught between cost and operational problems and the clamor for pollution elimination. Adsorption of organic solvent vapor on active carbon can be tailored to the situation, to attain the desired standards. It is important to consult with the equipment manufacturer, and rely on his technical expertise and experience. Recovery and reuse of the adsorbed organic solvent is a goal, but purification of the recovered organic solvent may cause problems. The removal of impurities (peroxides, decomposition products, coloring matter). combustibility, and explosiveness, must be considered. The presenc of impurities in the solvent will decrease the adsorptive capacity of active carbon. To prevent spontaneous combustion of the active carbon, the temperature of the adsorption tower must be maintained below 150 C. Active carbon made from coconut shells is most often used in recovery of solvent from vaporized solvent, and malodor removal. Cost problems occur, since coconut shells must be importe into Japan.

55806 **APTIC NO. 81008**

Klumb, David L.

UNION ELECTRIC COMPANY S SOLID WASTE UTILIZATION SYSTEM. *Union Electric Co., St. Louis, Mo., Solid Waste Utilization System, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 488-496. (Nov. 3-5.)*

The environmental impact of a solid waste utilization system developed by the Union Electric Co. is discussed. Boiler gas emission tests conducted independently by the Environmental Protection Agency and Union Electric disclose no serious emission problems. The solid waste has an average sulfur content of 0.10 to 0.15%. The conservation via recycling of metal resources such as tin, steel, copper, and aluminum offers a significant environmental advantage over landfill and incineration. There is a reduction in coal burned, but the coal savings do not have a significant impact on Union Electric s annual energy requirements.

55807 **APTIC NO. 80974**

Knirsch, H.

THE APPLICATION OF AIR COOLED STEAM CONDENSERS IN REFUSE INCINERATOR PLANTS. *GEA Gesellschaft fuer Luftkondensation, Bochum, West Germany, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 470-476. 2 refs. (Nov. 3-5.)*

Refuse incinerator plants are one of the most effective means to get rid of the steadily increasing amount of municipal and industrial waste. Pollution from dusts and other noxious matter is avoided by cleaning the flue gases before exhausting them to the atmosphere. Electrostatic precipitators are used for the cleaning. Before entering into the precipitator, the flue gases are cooled to a temperature of 400 C by passing the flue gases through a steam boiler and raising steam which can be used for various industrial applications. Air cooled steam condensers have definite advantages over the more classical method of water cooling. There is a steadily increasing number of refuse incinerators equipped with air cooled steam condensers of various designs.

55808 **APTIC NO. 73223**

Kobayashi, A.

AIR FUEL RATIO CONTROL BY SHUNT. *(Bunryuki ni yoru kunepi no seigyo). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 9-12, 1975. (Presented at the Japan Society of Mechanical Engineers, Lecture Meeting, Tokyo, Japan, April 1-3, 1975, Paper 750-5.)*

A shunt device for internal combustion engines recirculates part of the fuel to the injection pump while it introduces the rest to the injection nozzle to maintain an optimum air-fuel ratio. At acceleration, the amount of recirculation is reduced to increase the air-fuel ratio. Gasoline enters from the bottom of the shunt through automatic control nozzles and the amount to be introduced to the injection nozzle is dependent on running speed. The nozzles are automatically controlled by a control piston which responds to the pressure difference. When the accelerating pedal is firmly pressed, the return nozzle is closed and the recirculation is stopped. At this moment, all the over-drive nozzles are opened to give an over-load running such that the air-fuel ratio is maintained at a suitable value.

55809 **APTIC NO. 80718**

Kollrack, R. and L. D. Aceto

RECIRCULATION EFFECTS IN GAS TURBINE COMBUSTORS. *J. Eng. Power, 97(4):527-530, Oct. 1975. 4 refs. (Presented at the American Soceity of Mechanical Engineers, Annual Meeting, Winter, New York, Nov. 17-22, 1974.)*

The effects caused by recirculation of hot final combustion products into unburned or partially burned fuel/air mixtures were evaluated. The thermal effect dominates the combustion activity. Dilution and the introduction of active radicals produced lesser results. Internal recirculation in gas turbine combustors, such that as produced by swirl or bluff body stabilization, differs from external recirculation by the temperature levels of the recirculant and its composition. The net effect of recirculation is to simulate a longer residence time and/or an effective higher inlet temperature. The end products are closer to equilibrium; specifically, the carbon monoxide levels are lower and the nitric oxide levels higher. (Author abstract)

55810 **APTIC NO. 80939**

Krings, J.

FRENCH EXPERIENCE WITH FACILITIES FOR COMBINED PROCESSING OF MUNICIPAL REFUSE AND SLUDGE. *INOR S.A., Paris (France), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 305-312. (Nov. 3-5.)*

A process for the combined processing of municipal refuse and sludge is described. Municipal refuse constitutes a valuable heat source and obviates the necessity to provide a fossil fueled boiler for sludge drying. The overall combined heat balance shows a heat surplus. A vertical thin film dryer is the main component of the sludge drying system. By directly accepting the sludge from the thickener, this dryer reduces the number of processing elements in the system. It offers real economy by making the use of reactive chemicals for chemical conditioning of the sludge unnecessary. The dryer does not recycle a filtrate that by itself would constitute a considerable load on the sewage treatment plant. The vapor driven off the dryer is discharged into and deodorized in the furnace without causing any additional load on it.

55811 **APTIC NO. 80897**

Kuehn, D. G., S. E. Khalafalla, and L. M. Chanin

DECOMPOSITION REACTIONS OF NITROGEN OXIDES IN DIRECT CURRENT GLOW DISCHARGES. *Dept. of the Interior, Twin Cities, Minn., Twin Cities Metallurgy Research Center, Bureau of Mines RI 8063, 19p., 1975. 14 refs.*

A possible pollution control approach using electrical discharges to convert the undesired effluent to nonpollutants prior to emission was studied. Studies were conducted to determine the positive ions and neutral species produced in glow discharges of gas streams containing 1.0% nitric oxide in helium, 29% dry air in helium, and 1.06% NO in nitrogen. Mass spectrographic measurements were made from 2.3 to 10.0 torr and direct currents from 10 to 20 milliampere. Effective plasma removal reactions existed within direct current glow discharges of 1.0% NO in helium. An approximate 95% reduction in discharges indicated an electrically induced dissociation of NO to nitrogen and oxygen. Consistent with known reaction rages, N_2 was the principal recombination product. Mass spectrographic analyses of the species emerging from the active discharges indicated an electrically induced dissociation of NO to nitrogen and oxygen. Consistent with known reaction rates, N_2 was the principal product of the recombination. Smaller amounts of O_2 were observed. Less reactive materials in the cathode assembly increased O_2 concentrations. No other nitrogen oxides were detected among the neutral species. Formation of NO_x was not apparent for direct current glow discharges of a mixture of 29% air in He, although O_2 was consumed. Marked reduction in the NO concentration was also observed for discharges of a mixture of 1.06% NO in N_2; thus, excited states of He are not prerequisite to NO dissociation. (Author abstract modified)

55812 **APTIC NO. 80609**

Lauren, Oscar Bud

ODOR MODIFICATION. *Preprint, Environmental Odor Consultant, Countryside, Ill., 15p., 1975. 21 refs.*

An odor modifier is a specifically designed formulation of aromatic chemicals to achieve interaction of odorous molecules in a gasous state which will result in the desired decrease of olfactory intensity. It is contrasted with odor masking. Examples of the use of odor modification are included. Situations in which odor modification should not be used are also discussed.

55813 **APTIC NO. 80656**

Lauren, Oscar Bud and Fred O. Gilbertsen

DRYING BEDS AND ODOR CONTROL. *Preprint, Consoer, Townsend and Associates, Chicago, Ill., 10p., 1975. 4 refs. (Presented at the International Pollution Engineering Congress, 4th, Cleveland, Ohio, Oct. 20-22, 1975.)*

The need for odor control in the operation of sludge drying beds and unconfined sources of malodors is discussed. Degrees of intensity of smell, names of smells, and other classifying details vary from person to person. Methods of odor control include sedimentation, filtration, biological treatment, aeration, oxidation by chemicals, adsorption, masking, and modification. Methods of applying odor modifiers are discussed. Practical applications are cited for the abatement of existing conditions. The costs of odor modification are minimal. (Author abstract modified)

55814 **APTIC NO. 79841**

Lee, Wenpo and Winfried Geffers

ENGINE PERFORMANCE AND EXHAUST EMISSIONS CHARACTERISTICS OF SPARK-IGNITION ENGINES BURNING METHANOL AND METHANOL-GASOLINE MIXTURES. *Preprint, American Inst. of Chemical Engineers, New York 36p., 1975. 7 refs. (Presented at the American Institute of Chemical Engineers Meeting, Boston, Mass., Sept. 9, 1975.)*

Laboratory and field measurements of exhaust emissions from spark-ignition engines burning methanol and methanol-gasoline mixtures are discussed. Emission levels were compared for engines running on pure methanol, pure commercial gasoline, and methanol-gasoline mixtures consisting of 15 vol% methanol and 85 vol% gasoline. Nitrogen oxide emissions from a single cylinder tes engine at full throttle operating on methanol amounted to less than 15 g/KWH as compared to over 20 g/KWH for pure gasoline operation and about 19 g/KWH for methanol-gasoline operation. Carbon monoxid and hydrocarbon emissions from a four-cylinder passenger car (European Test, cold start) were 136 and 9.8 g/test for gasoline operation, 56 and 8.3 g/test for methanol-gasoline operation, and 102 and 12.0 g/test for pure methanol operation. The addition of methanol to gasoline or the use of pure methanol also improved polynuclear aromatic emissions. Unburnt methanol and aldehyde emissions were greater with methanol and methanol/gasoline operatio than they were for gasoline operation, although these emissions wer easily controlled by adding water to the methanol or by employing afterburning.

55815 **APTIC NO. 81019**

Leonard, Joseph W.

POTENTIAL FOR FURTHER LOWERING SULFUR IN INTENSIVELY CLEANED COAL AT MINES. *Trans. Soc. Mining Engrs. AIME, 258(3):227-229, Sept. 1975. 6 refs.*

Most coal processing is achieved through a wide assortment of techniques that are based on the separation of particles according to their specific gravity. Variation in the specific gravity due to coal type can be substantially reduced by introducing geologic and geographic constraints. Such constraints make mineral matter composition the predominant variable in the determination of specific gravity. For any given coal reserve, mineral matter, expressed as a function of ash-sulfur ratio, provides an index value by which the composition of raw coal, originating from various locations in the reserve, can by typed to predict the ash and sulfur composition of product fractions resulting from separation at various levels of specific gravity. Continuous sorting methods by which different raw coal types can be processed separately to produce super-clean coal in addition to coals cleaned to more common levels of sulfur are discussed. (Author abstract modified)

55816 **APTIC NO. 80970**

Levy, Steven J.

THE CONVERSION OF MUNICIPAL WASTE TO A LIQUID FUEL BY PYROLYSIS. *Environmental Protection Agency, Washington, D. C., Office of Solid Waste Management Programs, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 226-231. 3 refs. (Nov. 3-5.)*

A process for the conversion of municipal solid waste to a liquid fuel by pyrolysis is described. The San Diego County Demonstration plant will recover at least 0.15 cu m of liquid fuel (equivalent in heating value to 0.1 cu m of No. 6 fuel oil) from each metric ton of municipal solid waste (36 gal/short ton) using the Garrett flash pyrolysis system. When the organic feedstock is mixed with hot char, it decomposes into a gas char mixture. The gas is then immediately cooled to produce liquid fuel. A mechanical separator or cyclone is used to remove the char from the gas. The char, which now consists of the char fed into the reactor as well as that newly formed by the pyrolysis reaction, is stored for reuse in the reactor. Before being recirculated to the reactor, this stored char is reheated. Excess char is removed for disposal in a sanitary landfill. This system employs a relatively complex fuel preparation process system involving two stages of shredding and air classification. (Author summary modified)

55817 **APTIC NO. 80990**

Low, Robert A.

ENERGY CONVERSION IN NEW YORK. *City of New York, N. Y., Environmental Protection Administration, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 250-255. (Nov. 3-5.)*

The environmental effects of New York City's plan to recover energy from solid wastes are discussed. Pyrolysis gas firing holds the promise of higher firing rates from refuse with diminished particulate and ash handling problems. It has the potential to handle all of the City's refuse. But such energy recovery could degrade air quality, unless the City installs extremely expensive air pollution control equipment. New low polluting technologies such as pyrolysis await further development before achieving large scale use. Potential air pollution from energy recovery facilities is a crucial factor in the program. For any proposed energy recovery plant, a sophisticated aerometric dispersion computer model and data base is available to determine whether particulate emissions are compatible with the Federal ambient air quality standards.

55818 **APTIC NO. 75951**

Lowell, P. S. and T. B. Parsons

IDENTIFICATION OF REGENERABLE METAL OXIDE SO2 SORBENTS FOR FLUIDIZED-BED COAL COMBUSTION. *Radian Corp., Austin, Tex., Environmental Protection Agency Contract 68-02-1319, Task 10, Program Element 1AB013, Rept. EPA-650/2-75-065, 204p., July 1975. 8 refs.*

NTIS: PB 244402/AS

Fifty three single and binary metal oxides were evaluated as candidate sulfur dioxide sorbents for a fluidized bed coal combustion process. The oxides were screened on the basis of their potential to react with sulfur dioxide to produce sulfates. Thermodynamic calculations were made to determine metal oxides for which the total sulfur oxides partial pressure in the flue gas would be reduced to 100 ppm. Process temperatures considered were 600 to 1400 C. Regeneration calculations were made with a reducing gas at one atmosphere total pressure. Sorption or regeneration conditions other than these might change the conclusions slightly. The sorption criteria used were that the sorbent must be stable enough to sorb SO2 but not so stable that regeneration would be difficult. Sodium, calcium, strontium, and barium oxides; lithium, sodium, calcium, strontium, and barium aluminates; lithium and sodium ferrates; and lithium, strontium, and barium titanates produce sulfates with the required stability. The oxides were further evaluated to identify those which could be regenerated directly by reductive decomposition of the sulfate in the temperature range 600 to 1400 C. Six reducing agents, varying in type and stoichiometry, were considered.

55819 **APTIC NO. 79968**

Mann, R. F., D. Tycholiz, and A. Stanislaus

THE KINETICS AND MECHANISM OF THE OXIDATION OF CARBON MONOXIDE OVER AN INDUSTRIAL VANADIUM OXIDE CATALYST. *Can. J. Chem. Eng., 53(4):438-442, Aug. 1975. 43 refs.*

The rate of catalytic oxidation of carbon monoxide was studied in a fixed bed reactor over the following range of conditions: 325 to 396 C, 0.11 to 1.75 mole% oxygen, and 9.50 to 10.20 mole% carbon monoxide. The catalyst was vanadium oxide/potassium sulfate on silica. Oxygen was the limiting component, most of the runs were taken to greater than 10% oxygen conversions, and therefore an integral approach was taken in the data analysis. The data were correlated successfully by the steady state adsorption model with Arrhenius activation energies of 22.1 kcal/g mole for the oxygen chemisorption step and 18.0 kcal/mole for the reaction step. Value of oxygen adsorption rate constants are reasonably consistent with previous data from studies utilizing various aromatic hydrocarbons as reactants. Correlation of preliminary data indicates that the steady state adsorption model could be a special case of the triangular mechanism. (Author abstract modified)

55820 **APTIC NO. 81007**

Mantellini, Giuseppe

DRY RECYCLING PLANT. *Forni Impianti Industriali, Milan (Italy), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 602-607. (Nov. 3-5.)*

The design and operation of a dry recycling plant for municipal refuse are described. The plant is fully automated and sorts ferrous materials, organic matters, cellulose products, and plastics. The plant consists of the following basic stages: continuous rate feeding, elimination of the electrostatic charge from sheet plastics; magnetic separation of ferrous materials; shredding of the refuse and breaking of plastic bags; separation and screening of organic matter; aerodynamic separation of glass and other heavy components from organic matter; and aerodynamic separation of the paper and plastics. The separation efficiency for various waste materials was determined.

55821 **APTIC NO. 80727**

Masuda, S.

ELECTRIC WASTE GAS CLEANING APPARATUS. *(Denkishiki haigasu joka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-6675. 5p., March 17, 1975. (Appl. Nov. 28, 1970, 7 claims).*

An electrostatic waste gas cleaning apparatus for mining industries is described. In order to reduce the density of dust, mist, and gaseous pollutants such as sulfur oxides, hydrogen sulfide, and nitrogen oxides, wet and dry electrostatic dust collectors are combined in series. Absorbents of various gases are added for greater cleaning efficiency. The slurry collector and its outlet are designed for convenient operation. The first part of the system serves as both a dryer of collected slurry and a filter of incoming gas.

55822 **APTIC NO. 73368**

Matsui, Kei

COUNTERMEASURES AGAINST HOT CORROSION IN AUTOMOBILE EMISSION CONTROL HARDWARE. *(Jidosha haishutsu gasu joka sochi ni okeru koon fushoku boshi taisaku). Text in Japanese. Kagaku Kogyo (Chem. Ind.), vol. 1975:521-523, May 1975. 4 refs.*

Countermeasures against high-temperature corrosion in thermal reactors are described. Oxide films on thermal reactors retard corrosion, but are subject to peeling, pitting, and separation. Air-cooling the inner shell of thermal reactors and lowering the temperature by 100-160 C, results in great cost reduction in materials needed for, and in construction design of, thermal reactors. Oxide films on the surface of thermal reactors, which act as protective barriers against corrosion, are formed from reaction at the surface, or by deposition of oxide film during the original manufacturing process. Ferrite steel containing aluminum does not have high-temperature strength, but can form aluminum oxide film which adheres well to the surface and withstands high-temperature corrosion from lead compounds. Austenite steel is impervious to heat, but oxide adhesion is poor, and high-temperature corrosion resistance is poor. For formation of oxide film by surface treatment, an improved aluminum-ferrite steel was developed by Toyo Industries.

55823 **APTIC NO. 30943**

Matsumoto, K., S. Kurisu, and T. Oyamoto

DEVELOPMENT OF PROCESS OF FUEL RECOVERY BY THERMAL DECOMPOSITION OF WASTE PLASTICS. *Mitsubishi Heavy Industries, Ltd., Tokyo (Japan), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 538-543. (Nov. 3-5.)*

A practical thermal decomposition process for fuel recovery from waste plastics containing polyvinyl chloride is described. The materials are melted by hot flue gas and kept at 300 C. The chlorine which is contained in the material is sent to a condenser operating on the hydrogen chloride absorption principle, which may be omitted if chlorine content in the material is very small. The gasified materials delivered from the decomposition vessel are cooled by a condenser and separated into liquid and gaseous products. The gaseous product, which contains only a small amount of HCl, is led to a neutralization tower via an absorption tower for washing down the remaining HCl and is then stored in a gas holder. The liquid product is stored in an oil tank. The exhaust gas from the decomposition vessel is utilized in the melting and drying process for the improvement of thermal economy. The recovered fuel oil is similar to light oil or kerosene, with a caloric value of 11,000 kcal/kg, and is sufficiently low-sulfur for use in conventional boilers.

55824 **APTIC NO. 79925**

Matsumura, S.

ENVIRONMENTAL POLLUTION CONTROL OF MERZ TYPE LIME FURNACE. *(Meruts shiki sekkairo no kogai boshi taisaku). Text in Japanese. Sekkai (Lime), no. 235:1-14, July 1975.*

Environmental pollution related to the Merz lime kiln includes particulates, noise, and waste water. A description of the Merz lime kiln process, is given, with specifications, and operating conditions of its pollution control system. The particulate removal system consists of a cyclone for larger particulates and a wet scrubbing tower for smaller particulates. The quantity and chemical composition of the kiln exhaust gas and treated flue gas, and the particulate concentration, particle size distribution, and chemical composition of particulates are also given. The over-all collecting efficiency for particulates was 99.2%.

55825 **APTIC NO. 73317**

Matsumura, Yuji

NOX REDUCTION AND ENERGY CONSERVATION MEASURES (2). *(NOx teigen to sei enerugi taisaku (2)). Text in Japanese. Netsu Kanri To Kogai (Heat Management Public Nuisance), 27(1):73-81, Jan. 1975.*

Energy conservation measures in heating technology of steel-manufacturing furnaces are described, with applicability to nitrogen oxides reduction. Insulation and design improvements in annealing furnaces, improvement in operation procedures, utilization of residual heat, and recovery of waste heat all contribute to energy conservation. At the same time, by suitable combustion control, NOx emission can be controlled by such means as off-stoichiometric combustion and two-stage combustion. Rather than merely installing NOx elimination devices, it may be more desirable to apply total heat control technology to hold NOx amounts at allowable levels, while increasing production.

55826 **APTIC NO. 79859**

McCarthy, James E. and George T. Paul

STARTUP AND OPERATION OF THE FLUE GAS DESULFURIZATION SYSTEM AT THE CHOLLA STATION OF ARIZONA PUBLIC SERVICE COMPANY. *Preprint, Research-Cottrell, Bound Brook, N. J., Air Pollution Control Group, 21p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975.)*

The startup and operation of the wet limestone scrubber system installed on the 115 MW pulverized coal boiler at the Cholla Generating station are described. The system operated continuously for over a year with a sulfur dioxide removal efficiency greater than 90% and on a stream more than 90% of the time. Downtime has been caused 84% by mechanical problems and 16% by electrical problems. Each of the two absorber towers in the flue gas desulfurization system is preceded by a variable throat Flooded Dis Scrubber for particulate emission control. Discussion covers syste performance, availability, and capital and operating costs. Specific startup problems and their solutions are also identified. (Author abstract)

55827 **APTIC NO. 80951**

McQueen, H. J.

ENERGY RECOVERY FROM WASTES IN CANADA. *Concordia Univ., Montreal (Quebec), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 149-156. 27 refs. (Nov. 3-5.)*

The potential energy recoverable from municipal wastes in Canada was analyzed. The technology currently deployed or under development in Canada includes: incineration, solid fuel preparation, pyrolysis and gasification, anaerobic digestion, reclamation and recycling, the scrap industry, post incineration scrap, composting, and recycling by citizen groups or government centers. The division of powers between the federal and provincial governments makes the control of pollution more difficult. The federal government has developed national standards but has direct jurisdiction only for international or interprovincial pollutants The provincial governments have developed their own laws and the enforcement is not equally strict. The provincial governments are indirectly responsible for solid pollutants insofar as they have jurisdiction over municipalities which traditionally have managed solid wastes.

55828 **APTIC NO. 79852**

Meguerian, G. H. and F. W. Rakowsky

NOX REDUCTION CATALYST DEVELOPMENT. *Preprint, Amoco Oil Co., Research and Development Dept. 23p., 1975 (?). 14 refs.*

The kinetics of ammonia formation in nitrogen oxide catalyst system designed for motor vehicle exhaust emission control is discussed. Low carbon monoxide/oxygen ratios, high temperatures (above 1100 F), and high space (or linear) velocities are prerequisites for minimizing NH3 formation over currently proposed NOx catalysts in dual catalyst systems. These prerequisites, however, place limitations on operating conditions of vehicles equipped with dual catalyst systems which may require costly fuel metering systems and some sacrifice in fuel economy and performance. Triple catalyst systems show a potential for achieving high net NOx efficiencies without the imposition of severe operating conditions on vehicles. These systems simply require diverting part of the secondary air over an NH3 catalyst which can be done by means of an orifice. (Author conclusions modified)

55829 **APTIC NO. 73280**

Mitzinger, Wolfgang

POWER ECONOMY AND ENVIRONMENTAL PLANNING PRESENTLY BEING CONSIDERED A DISTRICT OF THE GERMAN DEMOCRATIC REPUBLIC. *(Energiewirtschaft und Umweltgestaltung, dargestellt an der Entwicklung eines Bezirkes der Deutschen Demokratischen Republik). Text in German. Energietechnik, 25(2):80-87, Feb. 1975. 4 refs.*

Power economy and environmental protection in the Cottbus district of East Germany, an area with huge brown coal reserves and large-capacity power plants, are described. The brown coal extracted here has a calorific value between 1800 and 2300 kcal/kg, and sulfur contents ranging from 0.8 to 1.3%. Much of the brown coal is converted into briquettes, high-temperature coke, and gas. New briquetting plants are established at great distances from residential areas to abate dust loads. The coking and gasification plants are equipped with high-efficiency dust separators, and odor emissions are controlled by the use of closed technological systems, purification and addition of the purified waste gases to town gas, and thermal and catalytic afterburning. The sulfur dioxide emissions in large-capacity power plants are abated by the use of stack heights over 300 m. Experiments with the addition of dry limestone to the flue gases to abate SO2 emissions are highly promising. Dust emissions, limited to 150 mg/cu m, are controlled by three-stage electrostatic precipitators with an overall efficiency of 98-99%.

55830 **APTIC NO. 73451**

Mizutani, Yukio and Masashi Kaozuki

EXHAUST GAS COMPOSITIONS IN GAS TURBINE ENGINE. *(Gasu tabin nenshoki no haiki sosei). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(2):95-102, 1975. (Special Issue)*

A new axis-symmetrical, two-dimensional model of cylinder type gas turbine combustor was developed. The counterflow region was replaced with a super-swirled counterflow region which had heat and material exchanges with the surrounding main flows. A boundary layer approximation was applied to the main flows, and axis-symmetrical, two-dimensional distributions of flow speed, temperature, and chemical concentrations were obtained by numerical analysis. An experiment was also carried out using a cylindrical combustor 350 mm long and 60 mm in diameter with 8 rows of liner air holes having diameters of 6 mm and 8 mm. The first row had 4 air holes while the rest each had 8 air holes. A swirl type sprayer was equipped at the center of the upper stream side in the liner. White kerosene was used as fuel. Sampling of the combustion gases was carried out by using a probe with an 0.8 mm throttle at its end. Nitrogen, oxygen, carbon monoxide, carbon dioxide, hydrogen, and hydrocarbons were analyzed by gas chromatography while nitric oxide was analyzed by non-dispersive infrared. The calculated NO concentration at the high temperature region was noticeably higher than the observed value, but the calculated NO concentrations were generally lower than the observed values.

55831 **APTIC NO. 73264**

Mori, Isamu

DESULFURIZATION EQUIPMENT. *(Datsuryu sochi). Text in Japanese. (Ebara Infilco Co. Ltd., Tokyo (Japan)) Japan. Model Util. Sho 50-10453. 3p., April 2, 1975. 1 ref. (Appl. Nov. 19, 1969, 1 claim).*

A desulfurization apparatus is described which removes hydrogen sulfide from gases generated by human or industrial waste treatment. A cylindrical tower which is filled with desulfurizing agents such as ferric oxide has two valves on both ends. The upper valve is used to introduce the new desulfurizing agent to the tower, and the bottom valve removes the used desulfurizing agent. The bottom is V-shaped so that the desulfurizing agent can be removed smoothly. The untreated gas enters from the bottom of the tower and emerges from the top. The tower is heated externally to prevent the condensation of moisture within the tower. The two valves on the tower facilitate addition and removal of the desulfurizing agent.

55832 **APTIC NO. 73260**

Moriya, Hisanori

A EXHAUST GAS CIRCULATOR FOR INTERNAL COMBUSTION ENGINES. *(Nainenkikan haikigasu kanryu sochi). Text in Japanese. Hitachi, Ltd., Tokyo (Japan)) Japan. Pat. Sho 50-3448. 3p., Feb. 5, 1975. (Appl. Nov. 29, 1971, 1 claim).*

An exhaust gas circulation device is described for internal combustion engines. A mechanically operated circulation valve is installed in the circulation tube connecting the exhaust pipe and intake manifold. The valve is shaped like a spherical ball with a diameter similar to the circulation tube, with one quadrant of the ball removed. The ball valve is connected to the throttle valve of carburetor by a shaft, and closes the circulation tube when the throttle valve is either idling or fully opened. The throttle valve in any angle except these two extreme positions regulates the opening of the ball valve, thus regulating the amount of circulating gas.

55833 **APTIC NO. 73456**

Muroki, I.

EXHAUST GAS CONTROL IN ENGINE USING THERMAL REACTORS. *(Samaru riakuta o mochiiru hibana tenka kikan no haiki taisaku). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(2):30-40, 1975. (Special Issue).*

Two thermal reactor systems, rotary engine anti-pollution systems (REAPS) and conventional engine anti-pollution system (CEAPS), were described. The pollution control was achieved by improvements of various apparatus including the ignition apparatus, secondary air control valve, control apparatus at deceleration, and fast-heating apparatus. Control of optimum secondary air is essential for the reduction of the emission level and is one of the most important factors for a thermal reactor system. A control valve having an air injection nozzle and an air by-pass was equipped. The control valve corresponded to engine operation conditions such as rotation number and load. A deceleration control valve was equipped in REAPS to adjust the air-fuel ratio and prevent after-burn during deceleration. In CEAPS, ignition time was delayed to promote recombustion of the exhaust during deceleration. A 1600 cc CEAPS engine and a REAPS 654 cc by 2 rotors engine were tested for their exhaust levels. The CEAPS engine tested by the 10-modes method emitted 1.74 g/km carbon monoxide, 0.19 g/km hydrocarbons and 0.74 g/km nitrogen oxides while the REAPS engine tested by the 1975 FTP mode method emitted 7.0 g/mile CO, 0.71 g/mile HC and 1.30 g/mile NOx.

55834 **APTIC NO. 81002**

Mutke, Reinhold

COMBINATION OF INCINERATION AND ELECTRICITY GENERATION. *Vereinigte Kesselwerke AG, Duesseldorf (Germany), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 105-112. (Nov. 3-5.)*

The advantages of using refuse as a fuel for the generation of electricity are discussed. Refuse incineration produces useful energy, allows for recycling of metals, and the processing of the ash to gain a product which can be used for filling purposes. Plants for the incineration of refuse are designed like modern steam power stations with special precautions against the emission of noise, dust, and odor. Stack emissions are minimized by dust collectors and gas scrubbing. Refuse incineration requires high investment and operational costs. The net cost can be reduced greatly by effective use of the energy produced.

55835 **APTIC NO. 80804**

Naito, Uiro

STACK GAS AND EMISSION GAS PURIFICATION PROCESSING TECHNOLOGY, NO. 1, ELECTRIC DUST COLLECTOR. *(Haien haigasu jyoka shori gijyutsu, sono 1, denki shujin sochi). Text in Japanese. Kagaku Sochi (Plant and Process), 17(12):70-73, Dec. 1975.*

The Japanese patents on electric dust collectors are summarized. The number of patents has been increasing for dust collectors intended for use on building roofs, replacing conventional fans or cleaning facilities. Inventions that increase efficiency of dust collection are also common; they often work by adding secondary gas of high electron affinity, such as sulfur hexafluoride or carbon dichloride. Since the efficiency of electric dust collectors is greatly affected by the concentration, size, and electric resistance of dusts, many inventions to decrease the apparent electric resistance of dusts have been seen. Such inventions operate by spraying aqueous solutions, and by entrainment of dust on acid or alkali substances. There are inventions related to the discharge electrodes. The utilization of a third electrode can prevent segregated dust deposition on the collection electrode. There have been many improvements on collection electrodes, by which the scattering of collected dusts is prevented. Electric circuits for dust collectors have been improved, with better and more stable corona discharge. The recent trend in electric dust collectors is toward smaller size and lighter weight.

55836 **APTIC NO. 80760**

Nakagawa, Kazuo and Akira Ishizuya

COMBUSTION EQUIPMENT OF 2-CYCLE ENGINE. *(2 saikuru enjin no nensho sochi). Text in Japanese. (Honda Motor Co., Ltd. (Japan)) Japan. Pat. Sho 50-25083. 3p., Aug. 21, 1975. 2 refs. (Appl. Feb. 14, 1972, 1 claim).*

A 2-cycle engine was designed to improve ignition and stabilization at low-load operation as well as purification of exhaust gas by using a dilute gas mixture. The engine has a scavenging path connected to the crankcase and a gas pipe leading from the carburetor to the auxiliary combustion chamber. The crankcase is connected to the carburetor through a gas inlet. The gas pipe to the auxiliary combustion chamber is controlled by a gas valve which is opened by a rotary cam during scavenging. A dilute gas mixture is supplied from the carburetor through the crankcase to a cylinder. During the scavenging stroke, a concentrated gas mixture is supplied to the auxiliary combustion chamber. The concentrated air mixture is ignited near the top dead end of a piston and the flame is sprayed into the main combustion chamber, in which the previously supplied dilute gas mixture was burned. Thus operation of the engine with a dilute gas mixture was achieved, and the concentration of nitrogen oxides in the exhaust gas was reduced.

55837 **APTIC NO. 73444**

Nakajima, Yasuo and Yoshisada Hayashi

EXHAUST GAS CIRCULATOR FOR CONTROLLING NITROGEN OXIDES IN AUTOMOBILE. *(Jidosha no chisso sankabutsu seigyo haiki kanryu sochi). Text in Japanese. (Nissan Motor Co., Ltd., Yokohama-shi (Japan)) Japan. Pat. Sho 50-3447. 3p., Feb. 5, 1975. (Appl. Oct. 28, 1971, 1 claim).*

A system to recirculate all exhaust gas from one cylinder to other cylinders is described. Two carburetors are used, one of which controls only one cylinder, and the other controls the rest of the cylinders. The exhaust gas from the independent cylinder is totally recirculated to the carburetor controlling other cylinders whose exhaust gas is discharged into the atmosphere. The two carburetors are related to each other with the acceleration wire; however, the carburetor for the independent cylinder is designed to have a smaller throttle valve opening than that of the other carburetor and it is connected with the acceleration wire through a bellows whose length varies with the pressure of the intake manifold of the latter carburetor. By this means, the recirculating gas is limited to 15% to 20% of the total exhaust gas from the engine.

55838 **APTIC NO. 80722**

Nakajima, Yasuo and Takeharu Oguri

A DEVICE FOR KEEPING EXHAUST GAS-CLARIFICATION CATALYSTS FROM DETERIORATION. *(Haiki gasu jyokayo shokubai no rekka boshi sochi). Text in Japanese. (Nissan Motor Co., Ltd. Yokohama (Japan)) Japan. Model Util. Sho 50-20184. 3p., June 19, 1975. 1 ref. (Appl. June 30, 1970, claims not given).*

A device to prevent deterioration of the catalyst used for nitrogen oxides removal from automobile exhaust gases is described. An air supply pipe is attached to the exhaust pipe at the engine side of the catalyst. The pipe has a valve which opens and closes to control the air flow. When the pipe opens, air flows to the catalyst with the exhaust gas, providing an oxidizing atmosphere for the regeneration of the catalyst. The valve in the air pipe is synchronized with automobile running conditions by means of sensors that monitor engine speed, throttle valve angle, running speed, or radiator water temperature. The valve closes only when the exhaust gas contains high NOx concentrations, but whenever the running conditions are such as give lower NOx levels, the valve opens for catalyst regeneration.

55839 **APTIC NO. 73418**

Nakazawa, Makoto, Yoshio Saiki, Koji Nagami, and Saburo Sugano

INVESTIGATION ON HARMFUL COMPONENTS IN AUTOMOBILE EXHAUST BY IGNITION TIME ADJUSTMENT, ETC. *(Tenka jiki chosei to ni yoru jidosha haishutsu gas chuno yugai seibun no chosa). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:37, Feb. 1975.*

The effect of ignition time adjustment on automobile emission levels for carbon monoxide, nitrogen oxides, and hydrocarbons was studied. The ignition timing was adjusted both by the vacuum advancement of the distributor and the physical rotation of distributor component from 15 to 0 deg before the top dead center (BTDC). The NOx and HC levels decreased as the ignition timing approached 0 deg BTDC. The CO emission peaked slightly at 4 to 7 deg BTDC. Automobiles equipped with an ignition time adjustment device by vacuum advancement had lower emission levels than automobiles without the device.

55840 **APTIC NO. 73393**

Nasu, Hiroshi

STUDY ON PCB TREATMENT TECHNIQUE. *(PCB no shori gijutsu ni kansuru kenkyu). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(3):221-229, 1975.*

Combustion of PCB (polychlorinated biphenyls) as a treatment technique was carried out by using triple furnaces. Alumina particles were placed in the first combustion furnace to 22 cm in height and an oil-gas mixed burning burner was placed from the top toward the center of the alumina bed. The second combustion furnace was for tracing the decomposition of PCB with time. The third furnace was for complete combustion of the remaining PCB and propane was used as a supporting fuel. High temperature gas from the third furnace was led to a cooling tower and the cooled gas was washed with water in a washing tower. Combustion gases were sampled before and after the second furnace and at the exit of the washing tower. Analysis was by gas chromatography with an electron capture detector. The GC column was 3 mm by 2 m glass tube packed with 2% OV-1 Gaschrom Q.AW-DMCS (80/100 mesh) at 250 degrees with N2 at 40 ml/min as carrier gas. At a combustion temperature of higher than 1500 deg at the first furnace using kerosene as fuel, no PCB could be detected in the sampled gas or in the wastewater.

55841 **APTIC NO. 80655**

Newby, B. J. and V. H. Barnes

VOLATILE RUTHENIUM REMOVAL FROM CALCINER OFF-GAS USING SOLID SORBENTS. *Allied Chemical Corp., Idaho Falls, Idaho, Idaho Chemical Programs -- Operations Office, Energy Research and Development Administration Contract E (10-1)-1375 S-72-1, Rept. UC-70, TID-4500, 52p., July 1975. 14 refs.*

NTIS: ICP-1078

Laboratory studies were made to evaluate candidate adsorbents for maximizing removal of volatile ruthenium from calciner offgas. Silica gels, phenolic based ion exchange resins, styrene divinyl benzene ion exchange resins, acid resistant molecular sieves, porous glass, impregnated alumina, a copper sulfide exchanger, a zirconium oxide hydrate-dithionite exchanger, hydrous zirconium oxide gel, and ferric oxide were studied to determine their effectiveness in reducing the concentration of volatile ruthenium in calciner offgas by at least a factor of 100 and if they were attacked by or reacted vigorously with the offgas. Only two silica gels, a hydrous zirconium oxide gel, ferric oxide, and the zirconium oxide hydrate-dithionite exchanger gave satisfactory ruthenium decontamination and were chemically resistant at the simulated calciner offgas conditions. One of the silica gels, the hydrous zirconium oxide gel, and the ferric oxide were selected for more intensive studies. Laboratory results indicated that under the proper conditions these three sorbers reduce the volatile ruthenium concentration in calciner offgas by a factor of 1000 or more, have a high ruthenium sorption capacity, will sorb ruthenium effectively over a wide range of ruthenium offgas concentrations, and are resistant to attack by offgas. Silica gel is preferred over the other two sorbents because the hydrous zirconium oxide gel tends to cake when subjected to offgas below the dew point temperature, and pressure drops across beds of the coarsest size of the material available are significant; ferric oxide requires temperatures over 300 C for effective sorption of ruthenium and cannot be regenerated successfully. (Author abstract modified)

55842 **APTIC NO. 73263**

Nishinomiya, Torazo

AN EXHAUST GAS CLEANER. *(Haikigasu jyokasochi). Text in Japanese. (Hitachi, Ltd., Tokyo (Japan)) Japan. Pat. Sho 50-3453. 5p., Feb. 5, 1975. (Appl. Sept. 13, 1971, 1 claim).*

A mechanically controlled needle valve which adjusts fuel supply to automotive carburetors in order to reduce carbon monoxide emissions is described. The n-type semiconductor (stannic oxide) is installed in the exhaust pipe and senses the CO level in the exhaust gas. Whenever the CO level deviates from an arbitrarily adjusted point, the electrical conductance of the semiconductor varies; the motor connected to the needle valve of the carburetor is then activated. The rotation of the motor either closes or opens the needle valve to regulate the fuel supply to the carburetor, therefore keeping the CO level in the exhaust gas constant.

55843 **APTIC NO. 73262**

Nonaka, Koshiro and Kazushige Kimura

A WASTE GAS COMBUSTION PROMOTER FOR CONVERTER WASTE GAS DISPOSAL. *(Tenro haigasu shorisetsubi no haigasu nesho sokushin sochi). Text in Japanese. (Shin-Nippon Steel Co., Tokyo (Japan)) Japan. Model Util. Sho 50-9294. 2p., March 20, 1975. 2 refs. (Appl. April 15, 1968, 1 claim).*

A water-cooled air nozzle for waste gas combustion equipment associated with a converter for pig iron is described. The waste gas generated from the converter is mixed with air which is sucked through the space between the converter and hood; however, complete mixing cannot yet be achieved which lead to incomplete combustion of waste gas. A water cooled air nozzle is added to the hood. The nozzle injects supplemental air into the hood which creates a disturbing current within the hood, thus promoting complete mixing between waste gas and air. The nozzle is directed cocurrently with the waste gas flow and its angle is adjustable for 5 to 22 deg against the gas flow, preventing back-flow of the waste gas. Since the nozzle is water cooled, it can stand a temperature of 1500 C.

55844 **APTIC NO. 80668**

O Neill, E. P. and D. L. Keairns

SELECTION OF CALCIUM-BASED SORBENTS FOR HIGH-TEMPERATURE FOSSIL FUEL DESULFURIZATION. *Preprint, American Inst. of Chemical Engineers, New York, 26p., 1975. 19 refs. (Presented at the American Institute of Chemical Engineers National Meeting, 80th, Boston, Mass., Sept. 7-10, 1975.)*

High temperature fluidized bed desulfurization of fossil fuels in coal and oil gasification, and coal combustion, will use large supplies of calcium carbonate rock (limestone or dolomite) to trap the sulfur in solid form and prevent liberation of sulfur dioxide to the atmosphere. The establishment of stone selection criteria for choosing limestones and dolomites suitable for use as fluidized bed desulfurizing agents is an important part of the technical support studies needed to design the fossil fuel processing system. The stone selection criteria depend on the particular system design, the characteristics of the sorbent for given process operating conditions, and site factors such as sorbent availability and options for spent stone disposition. Sulfur removal, attrition, trace element release, regenerability and the environmental impact of processed spent sorbent are critical technical factors which impact selection criteria. Information and screening techniques are available to permit selection of sorbents on the basis of sulfur removal criteria. Preliminary data are available for other factors; however, definitive information or criteria are not yet available. (Author abstract modified)

55845 **APTIC NO. 80744**

Oda, T., K. Chiba, and H. Hosokawa

THERMAL DECOMPOSITION OF PLASTIC WASTE CONTAINING POLYVINYL- CHLORIDE. *Takuma Research and Development Co., Ltd., Osaka (Japan), Conver. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 561-566. 6 refs. (Nov. 3-5.)*

Use of plastic wastes for the reclamation of land and disposal by incineration are not sufficient to prevent environmental pollution. To solve this problem, a plastic waste disposal system by means of thermal decomposition was devised. When plastic wastes are burned in an incninerator, they tend to exhaust dark smoke, resulting from incomplete combustion. Especially in the case of combustion of polyvinyl chloride, serious corrosion problems as well as air pollution by hydrogen chloride gas will occur. The disposal system devised includes carbonization of plastic wastes for about 40 min at 280 C to 300 C to remove chlorine from vinyl chloride, recovery of hydrochloric acid through absorption by water from hydrogen chloride gas generated by the process, and incineration of the char obtained as a residue of carbonization. Various industrial and municipal plastic wastes were tested. Municipal plastic wastes contained about 20% materials other than plastics, which created difficulties in plant operation. The plastic wastes were adjusted to contain about 20% vinyl chloride by mixing the industrial and municipal plastic wastes. Hazardous components in the combustion gas were removed effectively by a venturi scrubber. The plant sufficiently served the purpose of preventing air and water pollution. Since it was of rather small capacity and was provided with additional equipment for testing purposes, its maintenance costs were high.

55846 **APTIC NO. 80766**

Ogawa, T., I. Nagashima, H. Tsujikawa, and Y. Uraguchi

STUDIES OF THE ADSORPTION AND DESORPTION RATES OF SULFUR DIOXIDE TO ACTIVATED CARBON BY MOVING BED. *(Idoso ni yoru aryusan gasu no kasseitan eno kyudatsuchaku sokudo no kenkyu). Text in Japanese. Kagaku Kogaku Ronbunshu (Chem. Eng. Essay), 1(5):494- 499, Sept. 1975. 10 refs.*

Activated carbon (Tsurumi coal, 2 mm in diameter and 3-5 mm in length) was dropped from a hopper to a moving bed with an internal diameter of 21.5 mm and a length of 40 cm. The dropping rate was controlled by a turntable at the bottom of the moving bed. Sampling taps were placed at 5 cm intervals on the moving bed column. The bottom of the moving bed was sealed with acrylic resin sheet to prevent the oxygen in air from entering. Nitrogen gas containing 1.3-3.8% sulfur dioxide was passed through the moving bed in a countercurrent. Sample gas (5-10 ml) was obtained through the taps by using a syringe and was analyzed by gas chromatography. Results showed that the gas concentration distribution in the moving bed could be expressed by a Langmuir type adsorption-desorption equation. The differences in rate constants obtained for different experiment series were examined with respect to flow condition, rate equation, and the effect of gas diffusion in solid particles.

55847 **APTIC NO. 80730**

Ohgi, K., H. Sente, N. Kada, and M. Todaka

STUDIES ON DUST DETERMINATION AT LIME PLANTS. *(Sekkai kojo ni okeru baijin sokutei ni kansuru kenkyu). Text in Japanese. Sekkai (Lime), no. 236:16-21, Aug. 1975.*

Three different types of exhaust hoods (A: cylindrical, 2.5 m inside diameter by 2 m; B: funnel type with a 1 m by 2.5 m leg; C: funnel type with a 0.5 m by 2 m leg) were installed on an in-ground lime kiln. The kiln was operated continuously and each cycle from feeding lime stone to discharge of the burned products required 60 min. The flow rates of the exhaust gas in the three hoods corresponded well to the crossection area of each hood. The suction rates were adjusted at 10-minute intervals using the average flow rate and average temperature. Dust concentrations determined by the JIS method were 0.316 g/N cu m, 0.242 g/N cu m, and 0.343 g/N cu m in A, B, and C hood, respectively. Cellulose fiber, glass fiber, and quartz glass fiber filters were used for collection of dusts from a lime digestion process. Cellulose fiber showed the smallest pressure loss with no decline in strength until it was damaged. Glass fiber and quartz fiber filters required a protecting metal net to increase their resistance.

55848 **APTIC NO. 80726**

Oishi, Hiroshi

APPARATUS FOR COLLECTION OF DUST AND GASES IN SMOKE. *(Baien no shujin narabini gasuno joka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50 6258. 3p., March 12, 1975. (Appl. June 9, 1970, 1 claim).*

An economical stack dust and gas collector is described. The system consists of three stages of capture and condensation of pollutants. The system is installed at the top of a chimney. In the first stage there are baffling plates which have steam nozzles and a spiral drain. Dust particles captured by steam are taken out through the drain. Above the baffle plates, there are multilayered separators. Gas captured by water is separated here. Separated gas and smoke go into the third stage, which consists of small tubes arranged radially and surrounded by coolant.

55849 **APTIC NO. 80679**

Oldaker, E. C., A. M. Poston, Jr., and W. L. Farrior, Jr.

LABORATORY EVALUATION OF PROPERTIES OF FLY ASH-IRON OXIDE ABSORBENTS FOR H2S REMOVAL FROM HOT LOW-BTU GAS. *Preprint, American Chemical Society, Washington, D. C., 12p., 1975. 7 refs. (Presented at the American Chemical Soceity National Meeting., 169th, Chicago, Ill., Aug. 25-29, 1975.)*

An absorbent for the removal of hydrogen sulfide from producer gas (hot low-Btu) was evaluated. Powered iron oxide and fly ash mixed with a suitable binder, extruded into cylinders, and sintered provided a solid absorbent with good physical strength and absorption capacity for H2S, while withstanding temperatures to 1500 F. Tars and particulates in the producer gas did not cause any ill effects to the absorbent as long as the temperature in the absorber bed was maintained above 1000 F. The build-up of carbonaceous material during absorption was burned out during regeneration of the sulfided absorbents. The absorbent possessed an average capacity of 10 wt% and an efficiency of 90-94%. (Author abstract modified)

55850 **APTIC NO. 80849**

Oldaker, E. C., A. M. Poston, Jr., and W. L. Farrior, Jr.

REMOVAL OF HYDROGEN SULFIDE FROM HOT LOW-BTU GAS WITH IRON OXIDE-FLY ASH SORBENTS. *Morgantown Energy Research Center, Morgantown, W. Va., Energy Research and Development Administration Rept. MERC/TPR-75/1, 9p., Feb. 1975.*

The removal of hydrogen sulfide from hot low-Btu fuel gas with iron oxide-fly ash sorbents was investigated. A 1500-standard cubic foot per hour side stream from the stack gas exit of a stirred, fixed-bed, air-blown gasifier was brought into contact with solid iron oxide-fly ash sorbents at a space velocity of 1900 vol/vol/hr. The absorption capacity of the sorbents averaged 8.25 wt% during four 15-hour absorption periods, and 90-94% of the H2S was removed. Carbonaceous material that deposited in the absorber bed during absorption was burned during regeneration of the sulfided sorbents with air. The main problem that occurred during the tests involved controlling regeneration temperatures so that the sorbents were protected from excessive temperature exposure. (Author abstract modified)

55851 **APTIC NO. 79960**

Onoda, Kuniyasu

TOYOTA S APPROACH TO MEET THE JAPANESE 1975 AUTOMOTIVE EMISSIONS STANDARDS. *(50-Nen haishutsu gasu kisei taisaku). Text in Japanese. Toyota Gijutsu (Toyota Eng.), 24(4):495-503, July 1975. 3 refs.*

The approach taken by Toyota to meet the 1975 Japan automotive emission standards is described. In Japan, the aim of these regulations is to attain the air purity levels of 1955. Actual emissions should be reduced to levels 10 to 20% below the standards At the same time, qualities which make a good automobile must be preserved: reliability; safety; driveability; cost; ease of maintenance; adaptability to mass production methods; applicability to as many cars as possible; and tie-in to future regulatory developments. Thermal reactors, catalytic converters, and controlled combustion systems are three ways of controlling emissions. Toyota has chosen the catalytic converter, but is developing a combination of catalytic converter and controlled combustion system. Since July 1974, use tests on catalytic converters have been conducted with 100 monitor cars, which have compiled an aggregate distance of 2.5 million km.

55852 **APTIC NO. 80800**

Onozuka, Mitsuo, Koki Nomoto, Kinji Iida, and Tomijiro Morita

PRODUCTION METHOD FOR CALCIUM SULFITE. *(Aryusan karushumu no seizoho). Text in Japanese. (Kureha Chemical Industry Co., Ltd. (Japan)) Japan. Pat. Sho 50-33988. 11p., Nov. 5, 1975. (Appl. Oct. 5, 1971, 1 claim).*

A method for producing calcium sulfite 1/2 hydride from a solution of alkali metal (sodium) acid sulfite and alkali metal (sodium) sulfite by adding calcium carbonate was developed to utilize the NaHSO3 and Na2SO3 recovered from a flue gas desulfurization process. To an aqueous solution containing 2-30 wt% of NaHSO3 and Na2SO3 (molar ratio of NaHSO3 to Na2SO3 in the range of 0.1-5.0) at pH 5.5-7.8, powdered CCaCO3 was added and reacted at 20-100 C, with stirring. The CaSO3 obtained was 1-100 micron in grain size (short axis 1-30 micron, long axis 5-100 micron). The polyolefin composition produced using CaSO3 has a matrix and good pliability which cannot be attained by the use of commercial CaSO3.

55853 **APTIC NO. 79912**

Paige, J. I., G. B. Robidart, H. M. Harris, and T. T. Campbell

RECOVERY OF CHLORINE AND IRON OXIDE FROM FERRIC CHLORIDE. *J. Metals, 27(11):12-16, Nov. 1975. 9 refs.*

A process for the recovery of chlorine and iron oxide from ferric chloride is described. A 16.5 cm diameter fluidized bed reactor system was designed to dechlorinate ferric chloride using oxygen. The use of a low density ferric chloride feed mixed with recycled ferric oxide, pretreated with a sodium chloride catalyst, produces usable iron oxide product and chlorine gas. High chlorine concentrations, greater than 80% by weight, are produced with low bulk density FeC13 (less than 1.3 g/cu cm). Bulk densities above 2.0 g/cu cm led to wall accretions and FeC13 carryover. The ferric oxide product from the dechlorination of FeC13 is upgraded by washing to remove minor amounts of soluble salts. Washed samples contain 70% by weight of iron and are suitable for blast furnace feed.

55854 **APTIC NO. 80912**

Persson, B.

RUBBER AS PROTECTION AGAINST WEAR, DUST AND NOISE. *(Gummi als Schutz gegen Verschleiss, Staub, Laerm). Text in German. Zement-Kalk-Gips (Wiesbaden), 28(8):331-336, 1975. 1 ref.*

The possible uses of rubber as protection against wear, dust and noise are described. The emission of respirable dust can be prevented most efficiently by partial or complete encapsulation of equipment with rubber sheets. Since it is flexible, rubber can be used for the encapsulation of vibrating and shaking equipment. It was possible to reduce the dust concentration in a quarry in Sweden from 20 to 0.5 mg/cu m by full rubber encapsulation of the equipment.

55855 **APTIC NO. 80651**

Pierson, William R.

SULFURIC ACID GENERATION BY AUTOMOTIVE CATALYSTS. *Preprint, American Chemical Society, Washington, D. C., Div. of Colloid and Surface Chemistry, 18p., 1975. 32 refs. (Presented at the American Chemical Society National Meeting, 170th, Chicago, Ill., Aug. 27, 1975, Paper 42.)*

The chemical and physical process underlying the emission of sulfuric acid from vehicles equipped with catalysts is described. The diluted exhaust particulate matter from such a vehicle, operating on unleaded gasoline, is almost entirely sulfuric acid and its associated water, with a very minor amount of ammonium sulfate. Ammonium sulfate can be the dominant species in exceptional circumstances. Sulfur dioxide does not store to a significant degree; oxidation to sulfur trioxide is first required. Sulfur trioxide is noncatalytically reduced to SO2 by hydrogen and by olefins at exhaust line temperatures (430 to 520 C) and at typical exhaust gas compositions. There are two regimes of catalyst operation: that in which the SO2 oxidation to SO3 reaches thermodynamic equilibrium, and that in which it does not. The effect of oxygen is very important. The effect of catalyst aging only recently has begun to be investigated thoroughly. Cyclic operation emissions are less than one might expect from cruise data. Storage at low temperature and high O2, followed by thermal and reductive release and homogeneous reduction at high temperature and low O2, may be responsible. Rotary, stratified charge, and diesel systems are also discussed.

55856 **APTIC NO. 81001**

Pietka, Jozef and Jerzy Zielinski

THE ENERGETIC UTILISATION OF THE COMMUNAL REFUSE ON THE EXAMPLE OF KATOWICE REGION. *Regional Assoc. of Communal Economy, Katowice (Poland) and Silesian Technical Univ., Gliwice (Poland), Inst. of Environmental Protection Engineering, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 275-279. (Nov. 3-5.)*

The composition of waste products from the pyrolysis of rubber wastes was analyzed. The gas contained 63% hydrogen, 27% methane, 3% carbon dioxide, 4% ethane and ethylene, and 1% non-combustible gases. The oil condensate was 38% light fraction, with a 1% sulfur content. The coke simile fuel contained: 7% ash and 90% carbon, and had a calorific value of 7000 kcal/kg. The ash is 50% metallic zinc.

55857 **APTIC NO. 80915**

Poetschke, Herbert

SEPARATION OF SOLID AND LIQUID WASTE SUBSTANCES. *(Trennen fester und fluessiger Abfallstoffe). Text in German. Wasser Luft Betrieb, 19(9):507-514, 1975. 2 refs.*

New developments in wastewater treatment, air pollution control and in [illegible]tal recovery are described. The changes in the physical state of the waste gases, and the influence of different parameters on waste gas separation are studied on a pilot gas scrubber by means of computer (developed by Buettner-Schilde-Haas). A new droplet separator, developed by the same company, has an efficiency of 99.9% at low pressure loss. A tower type issue filter with superimposed cyclone separator as first stage is used as a compact filter unit primarily in foundries. Waste gases generated in a maleic acid production plant, containing solvents, benzene, and carbon monoxide, are incinerated in a catalytic incinerator with 50,000 N cu m/hr capacity at temperatures above 500 C after the waste gases are preheated from about 40 C to 370 C. The flue gases are cooled in a preheater before they are discharged. Sulfur dioxide is retained on special adsorbent coke at 120-180 C at efficiencies over 90% by a method developed by the Deutsche Babcock and Wilcox AG, Oberhausen. Desorption is done between 200 and 400 C, and a gas with high SO2 and carbon dioxide concentration is obtained.

55858 **APTIC NO. 80752**

Rabinovich, L. M., R. G. Besedin, and M. D. Smotrakova

METHODS OF ABATING AIR POLLUTION DUE TO SEWER SYSTEMS. *(Puti ustraneniya zagryazneniy atmosfery ot kanalizatsionnykh ustroystv). Text in Russian. Neftepererab. Neftekhim., no. 8:37-38, 1975. 2 refs.*

Methods for the prevention of air pollution from wastewater collection and canalization systems in synthetic fat substituent production are presented. Air pollution in such plants is due to the volatilization of organic compounds, such as acids, alcohols, aldehydes, esters, and other hydrocarbons from the relatively hot effluents. The emission of malodorous organic substances can be prevented by the construction of airtight sewer systems with local collection and thermal or other physical destruction of the malodorous emissions. Volatile components can be expelled from the wastewaters by blowing with air, and they can be destroyed by catalytic incineration.

55859 **APTIC NO. 80821**

Reinhardt, Robert C.

ENVIRONMENTAL ASPECTS OF RUBBER RECLAIMING AND RECYCLING (MANUFACTURING). *In: Conference Proceedings on Environmental Aspects of Chemical Use in Rubber Processing Operations, Akron, Ohio, Environmental Protection Agency, Washington, D. C., Office of Toxic Substances, Rept. EPA-560/1-75-002, p. 340-360, March 12-14, 1975. 10 refs.*

Operations involved in the reclaiming and recycling of rubber are reviewed, with particular emphasis on air pollution control measures. Effluent gases from dynamic devulcanization processes can be effectively purified by a high-energy venturi scrubber. The scrubber not only collects fine particulates but also condenses oil and condensable malodorous gases. A barometric scrubber can be installed downstream of the venturi scrubber to remove any additional minor pollutants. Particulate emissions from mill room operations can be reduced by the use of a special heavy-duty combination chopper blower in conjunction with high efficiency cyclones.

55860 **APTIC NO. 80667**

Rosenblad, Axel E.

THREE EVAPORATOR FLOW DIAGRAMS THAT ADAPT TO CURRENT ENERGY COSTS AND EMISSION REQUIREMENTS. *Preprint, American Inst. of Chemical Engineers, New York, 28p., 1975. 3 refs. (Presented at the American Institute of Chemical Engineers National Meeting, 80th, Boston, Mass., Sept. 7-10, 1975.)*

Three approaches for the concentration of black liquor are discussed, all of which incorporate features that reduce both operating costs and secondary treatment requirements for the evaporator condensates for kraft pulp mills. The vapor recompression cycle and heat releases from both continuous and batch digesters are used to reduce operating costs, while consideration is given to maintaining hot water production. A countercurrent flow of steam and condensate and large venting rates are used to provide essentially stripped condensate produced from the bulk of evaporation, leaving a very small amount of condensate that will require secondary treatment. The condensates are largely free of odor. (Author abstract modified)

55861 **APTIC NO. 80723**

Saito, Masaaki, Hiroaki Miyazaki, and Saburo Tsutsumi

SUB-COMBUSTION CHAMBER TYPE SPARK IGNITION INTERNAL COMBUSTION ENGINE. *(Fukushitsu shiki hibana tenka nainen kikan). Text in Japanese. (Nissan Motor Co., Ltd., Yokohama (Japan)) Japan. Model Util. Sho 50-28242. 3p., Aug. 21, 1975. 1 ref. (Appl. Dec. 7, 1971, claims not given).*

An improvement of the internal combustion engine equipped with a sub-combustion chamber is described. The sub-combustion chamber is located adjacent to the main combustion chamber, and a sloped chamber connects the two. The ignition plug is located inside the sub-chamber, and the spark ignition point is placed near the side of the main chamber, away from the center of the sloped chamber connector. When the air flows into the sub-chamber from the main chamber through the connector, the loss of spark can be prevented, since the air does not directly flow through the spark ignition point. The firing noise during the transition from sub-chamber to main chamber combustion can be reduced because of the closeness of the ignition plug to the main chamber.

55862 **APTIC NO. 80504**

Saltin, Aka

HOW A NEW SULFATE PULP FACTORY IN SWEDEN SOLVED ITS ODOR, EXPLOSION, AND DUST PROBLEMS. *(Wie bei der Inbetriebnahme einer neuen Sulfatzellstoff-Fabrik in Schweden die Geruchs-, Explosions- und Staubprobleme geloest wurden). Text in German. Allg. Forstz., 30(32):640, 1975. (Presented at the International Conference on Clean Air Maintenance Problems, in the Wood Processing Industry at the Trade Fair on Industrial Environment, Jonkoping, Sweden, 1974.)*

Solutions to the odor and dust abatement prolem in a new sulfate polp factory in an extended recreational area in Sweden are described. Malodorous emissions are collected in two separate systems, using one system for diluted malodorous waste gases containing hydrogen sulfide, dimethylsulfide, and mercaptans, which are then admixed to the primary and secondary air in a steam boiler for odor destruction. Frequent explosions and other troubles in the second system collecting concentrated malodorous gases made it necessary to build a separate furnace and to perform preliminary scrubbing of the waste gases with white liquor. The waste heat generated in this furnace is utilized in a preheater. The dust emission from the regenerating furnace is reduced to about 10% of the maximum allowable level by the use of three parallel-connected electrostatic precipitators.

55863 **APTIC NO. 73277**

Sano, Hiroshi, Tomizo Nakamura, Shinichi Anzai, and Ichiro Toyama

ON THE EFFECTIVENESS OF AN NOX INHIBITION ADDITIVE ON THE HYDROGEN COMBUSTION. *(Suiso nensho ni okeru NOx yokusei tenkazai no koka). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 1073. (Presented at the Japan. Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 4U16.)*

The inhibitory action of water, methanol, ammonia, heptane, octane, and decane additives on nitrogen oxides formation in hydrogen gas combustion is studied. Vaporized additive gases are added to the hydrogen gas through both the nozzle and side of a 10 mm burner. No inhibitory action by water up to 2% addition was observed, however the NOx formation was reduced to 80% to 85% with the 5% water addition to the hydrogen flame. When the hydrogen gas was replaced by methane gas, no inhibitory action by up to 5% water addition was obtained for the methane combustion. The NOx formation in an air-rich hydrogen combustion increased with the 0.1 to 1% NH3 addition. The hydrocarbon additives did not affect, or rather increased, the Nox formation in the combustion at the air-to-fuel ratio of 1, and they showed a NOx inhibitory action only in the fuel-rich combustion.

55864 **APTIC NO. 80649**

Sareen, S. S., R. A. Giberti, P. F. Irminger, and L. J. Petrovic

THE USE OF OXYGEN/WATER FOR REMOVAL OF SULFUR FROM COALS. *Preprint, American Inst. of Chemical Engineers, New York, 25p., 1975. 12 refs. (Presented at the American Institute of Chemical En-*

gineers National Meeting, 80th, Boston, Mass., Sept. 7-10, 1975.)

Experimental results have clearly demonstrated the versatility of the Ledgemont Oxygen Leaching process for depyritization of coals of vastly different ranks. Better than 90% of the pyritic sulfur can be removed from these coals in 2 hr. The reaction of oxygen with pyrite is temperature sensitive, having a measured activation energy of 14 kcal/mole. However, the temperature effect on coal oxidation is even more temperature sensitive, with an activation energy of 17.64 kcal/mole. Although higher temperatures would accelerate the pyrite removal, an economic penalty must be paid in higher coal losses and oxygen consumption. The rate of pyrite removal from coals is proportional to the square root of the partial pressure of oxygen. The formation of carbon dioxide is directly proportional to the partial pressure of oxygen. The operating conditions, in terms of temperature and pressure, may be optimized to yield maximum sulfur removal with minimum coal losses. The oxygen uptake by the coals appears to be pH dependent. This uptake may be minimized by operating the process at a high enough pH through the use of buffering agents. (Author abstract)

55865 **APTIC NO. 80571**

Sasaki, Kazuo, Yoichi Kizawa, Katsuhiko Fukaya, Hiroaki Yagi, and Masahiro Yoneyama

STUDIES ON IMPROVEMENT IN THE CATALYTIC PRODUCTION OF SULFURIC ACID. SIXTH REPORT: A STUDY ON THE OXIDATION OF SULFUR DIOXIDE WITH PURE OXYGEN. (No. 4). *(Sesshokushiki ryusan seizoho kaizen ni kansuru kenkyu (Dai 6 Po). Junsanso o mochiiru nisanka iou no sanka ni kans-ru kenkyu (Sono 4). Text in Japanese. Kanagawa Daigaku kogakubu kenkyu hokoku (Rep. Fac. Technol., Kanagawa Univ.), no. 13:54-73, March 1975. 22 refs.*

Iron-containing catalyst and commercially available vanadium catalyst were assessed experimentally. A 94.5% conversion rate of SO2 was obtained with about 10% SO2 in raw gas at 400 C. The result was not as good as expected with about 25% SO2. The best result on performance tests for ternary iron-chromium catalyst was obtained with antimony added, followed by bismuth and lead. Sulfur dioxide conversion for iron-chromium-antimony catalyst was about 75% with about 10% SO2 in raw gas at 600 C. The catalyst with Fe/Cr/Sb equal to 7 to 2 to 4 still yielded 75% at about 27% SO2 concentration. The optimum temperature for iron-chromium-bismuth catalyst was higher than that for the iron-chromium-antimony catalyst. A catalyst of Fe/Cr/Pb equal to 7 to 2 to 1.5 gave 61.5% conversion of SO2 with about 12% SO2 in raw gas at 650 C. The durability of the catalyst of Fe/Cr/Sb equal to 7 to 2 to 4 was tested for 36 hr. The catalyst has practical applicability. Iron-containing catalysts were prepared using sedimentation. After contact process, the apparent volume of catalyst reduced to 75-90%. The heat treatment temperature should be regulated in catalyst preparation. The commercial vanadium catalyst for sulfuric acid reduced its volume to 80%. The reflux ratio of SO2 was calculated for both one stage and two stage oxidation-absorption systems using the parameters devised from the experimental data. The results were 0.067 to 0.099 for the former and 0.013 to 0.015 for the latter. Merits and drawbacks of the process of oxidizing SO2 by pure oxygen are examined. Costs are estimated. (Author abstract modified)

55866 **APTIC NO. 80527**

Satchell, D. P. and B. L. Crynes

HIGH OLEFINS CONTENT MAY LIMIT CRACKED NAPHTHA DESULFURIZATION. *Oil Gas J., 73(48):123-124, Dec. 1, 1975. 4 refs.*

The high olefin content of cracked naphtha may have a significant influence on its rate of desulfurization. Cracked naphtha reformer feedstock, both thermal and catalytic, is much more difficult to hydrodesulfurize than the corresponding virgin naphtha. The cracked naphtha contains a larger portion of thiophenic compounds that are more difficult to remove than mercaptans or sulfides. Simple decomposition of thiols to form hydrogen sulfide and the corresponding olefin proceeds at a significant rate at typical hydrotreating temperatures. A typical naphtha desulfurization of a reformed feedstock requires sulfur removal down to the 1 ppm level. The net rate of desulfurization of naphtha is limited by both the olefin and hydrogen sulfide concentrations in the reactor. The sharp reduction in the rate of S removal at about 15 min space time is the result of the competing reaction of the olefins with H2S. Since a reformer feedstock must be desulfurized to less than 2 ppm total S, this effect of competing olefin reactions is of practical importance in limiting S removal from cracked naphtha.

55867 **APTIC NO. 80848**

Schultz, H., P. M. Sullivan, and F. E. Walker

CHARACTERIZING COMBUSTIBLE PORTIONS OF URBAN REFUSE FOR POTENTIAL USE AS FUEL. *Bureau of Mines RI 8044, 29p., 1975. 6 refs.*

The combustible portion of urban refuse which was mechanically separated at a Bureau of Mines pilot plant was successfully evaluated for its fuel value using standard coal analysis methods. The heating value of the combustible portion of the refuse ranged from 5760-9680 Btu. The sulfur and chlorine values of the combustible portion ranged from 0.1-0.2 wt% and from 0.1-0.5 wt%, respectively. The greatest source of variation in the measurements was the inhomogeneity of the refuse. Chemical tests that are normally applied to coal were successfully applied to refuse, and these tests are recommended as standard means for evaluating the combustible portions of municipal refuse.

55868 **APTIC NO. 80932**

Seki, Chichitada

NISSAN L20, L28 ENGINES THAT CONFORM TO 1975 JAPANESE EMISSION STANDARDS. *(Nissan sedorikku, guroria yo L 20, L 28 gata kikan). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(171):61-68, Oct. 1975.*

The new Nissan L 20, and L 28 engines, which have the Nissan Anti-Pollution System (NAPS) installed in compliance with the 1975 Japanese Emission Standards is described. The NAPS is designed to be used in the Nissan Cedric and Gloria models, and consists of a converter with catalysts. The new engines use a remodeled conventional carburetor and a secondary air injection system. These new engines can maintain conventional fuel costs, power efficiency and utility, yet have achieved exhaust emissions far below the average and maximum 1975 Japanese emission standards for carbon monoxide, hydrocarbons and nitrogen oxides. The engine, anti-pollution system, cylinder head, cylinder block, manifold, carburetor, catalytic convertor, secondary air injection system, exhaust gas recirculator, air cleaner with automatic temperature control, ignition system, and piping system are described.

55869 **APTIC NO. 80738**

Shigeta, Yoshihiro

DEODORIZING METHOD IN URBAN SCAVENGERY AND SEWAGE TREATMENT FACILITIES. *(Toshi no seiso shisetsu. Gesui shori shisetsu no dashu hoho). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 20(11):45-55, Nov. 1975.*

Deodorizing methods used in urban human waste treatment, refuse incineration and sewage treatment facilities for removing malodors from dirty water and substances are described. The sources of the malodors at these facilities and their compositions were investigated. Methyl mercaptan, hydrogen sulfide, methyl disulfide, trimethylamine, dimethylamine, ammonia, and carbonyl sulfide are the major contributors to offensive odors emitted from various sections of the facilities. The most frequently applied deodorizing equipment and methods are summarized as follows: direct firing type incineration deodorization equipment which is designed to conform to the required incineration condition of a temperature of 648 C and an incineration time of 0.3 sec; an activated carbon adsorption method which has a wide range of effective application at human waste treatment and sewage treatment facilities except for the short service life of activated carbon due to water adhesion on the carbon surfaces; an ozone oxidation method which calls for equipment consisting of ozone generating apparatus, reaction chamber and water washing tower; an ion exchange resin method which utilizes the porous ion exchange resin s molecular adsorption as well as electrical adsorption capability; and a coal adsorbent method which deodorizes the alkali based malodors using pulverized coal treated by concentrated sulfuric acid.

55870 **APTIC NO. 80802**

Shoda, Yukio

PRESENT STATUS OF STACK GAS DENITRIFICATION TECHNOLOGY. *(Haien dassho gijutsu no genjo). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), vol. 1975:50-60, Nov. 1975.*

The emission standard for NOx was established in 1973, and the target for the achievement of the emission standard was five to eight years. The flue gas denitrification methods, classified into dry wet methods are reviewed. The dry method includes selective and non-selective catalytic reduction, catalytic decomposition, adsorption, absorption, electron ray radiation and non-catalytic reduction. The wet method includes alkali or sulfuric acid absorption, oxidation absorption, complex formation and absorption and liquid phase reduction. The denitrification cost including plant construction cost and running cost is reviewed. Results of questionnaires concerning problems still to be solved, answered by several equipment manufactures, are given. Schedules for actual operation of denitrification system are also reviewed.

55871 **APTIC NO. 80933**

Shoji, Yuji and Shunichiro Akiyama

THE MATERIALS OF AUTOMOBILE EXHAUST EMISSION CONTROL EQUIPMENT. *(Jidosha haigasu shori sochiyo zairyo). Text in Japanese. Nainen Kikan (Internal Combust Engine), 14(172):78-89, Nov. 1975. 30 refs.*

The heat-resistant, anti-oxidizing stainless steel being used as a material for automotive exhaust emission control equipment installed in compliance with 1975-76 environmental regulations is described. Characteristics of the commercial stainless steel, (austenite, martensite, and ferrite) are discussed, including the chemical composition and general characteristics, anti-oxidizing characteristics, and super durability at high temperatures. The mechanical properties of the stainless steel developed specifically for use as materials for thermal reactors and mufflers of automotive exhaust emission control equipment are investigated, including the MF-2 and OR-1 of the Allegheny Lundlum Co., AISI 434 of the Nisshin Seiko Co., 18 SR of the Armco Co., 430 Zr of Sumitomo Kinzoku, NAR-X2 of the Sumitomo Group, heat-resistant austenitic steel containing yttrium of the Sumitomo Kinzoku Co., and austenitic steel patented by DuPont.

55872 **APTIC NO. 80642**

Snell, C. A. and J. C. Reed

REGULATORY AGENCY LOOKS AT PROCESS MODIFICATION FOR REDUCING EMISSIONS. *Ill. Environmental Protection Agency, Springfield, Div. of Air Pollution Control, p. 86-91, 1975 (?).*

Problems associated with the use of process modifications to reduce industrial emissions are discussed from the regulatory agency standpoint. Unlike control equipment which often has well established efficiencies, process modifications may be difficult to support in terms of data on their effectiveness. In situations where there does not appear to be an accepted method of sampling, the comparison of results from several different methods may be necessary. If standard emission factors are not applicable, technical justification of the proper factory may be needed, and actual on-site testing is necessary if such justification is lacking. The probability of failure for the process change must also be established in addition to agreement on an appropriate monitoring system. Types of process changes and modifications cited as examples include solvent changes in the ink manufacturing and coating industry, furnace type changes in foundry operations, and changes in drying temperature in corn wet milling.

55873 **APTIC NO. 80385**

Snyder, N. W., J. J. Brehany, and R. E. Mitchell

CLEAN FUELS FROM MUNICIPAL SOLID WASTE. *Preprint, Inst. of Environmental Sciences, 22p., 1975. 24 refs. (Presented at the Institute of Environmental Sciences Energy and the Environment, Annual Meeting, 21st, Anaheim, Calif., April 13-16, 1975.)*

Conversion to useful energy of the combustible portion of refuse is being accomplished by several methods: incineration to produce steam; pyrolysis to produce gas or oil; and shredding and air classification to produce supplementary fuel. Least costly and most advanced is using the shredded combustibles as supplementary fuel in a coal-fired utility power boiler. The cleanest fuel with more applicability is synthetic gas produced by an oxygen blown partial oxidation pyrolysis process by Union Carbide Corporation. This gas, mainly hydrogen and carbon monoxide, can be utilized in gas turbines or furnaces or be further converted to methane or methanol. (Author abstract)

55874 **APTIC NO. 80972**

Snyder, N. W., J. J. Brehany, and R. E. Mitchell

EAST BAY SOLID WASTE ENERGY CONVERSION SYSTEM. *Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 428-433. 5 refs. (Nov. 3-5.)*

The production of pipeline quality gas (methane) or a clean boiler fuel derived from refuse is described. The combustible portion of refuse is converted to useful energy by several methods: incineration to produce steam; pyrolysis to produce gas or oil; shredding and air classification to produce supplementary fuel. Least costly is the use of shredded combustibles as supplementary fuel in a coal fired utility power boiler. A clean fuel with most applicability is synthetic gas produced by an oxygen blown partial oxidation pyrolysis process. This nitrogen free gas, mainly hydrogen and carbon monoxide, can be used directly in gas turbines or furnaces or can be converted to methane or methanol. Ammonia and liquid hydrocarbons can also be produced from this synthetic gas. (Author abstract modified)

55875 **APTIC NO. 73499**

Springer, Karl J. and Ralph C. Stahman

DIESEL EMISSION CONTROL THROUGH RETROFITS. *Preprint, Society of Automotive Engineers, Warrendale, Pa., 16p., 1975. 13 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750205.)*

The results of fleet test demonstrations of two exhaust emission control retrofit kits, one for two-stroke diesel-powered buses and the other for four-stroke diesel trucks are reported. The retrofit kit for the buses which consisted of a fuel injector with an improved needle type valve, a vertical exhaust stack, and a catalytic muffler reduced odor emissions and smoke levels to about half those from buses equipped with conventional injectors. Hydrocarbon emissions with the improved injector were about 10% of those measured from buses with conventional injectors; carbon monoxide emissions were unchanged, and nitrogen oxides were slightly increased. The catalytic muffler was the only part of the kit that proved ineffective in controlling emissions. The retrofit kit for the trucks which consisted of a turbocharger and various engine adjustments reduced smoke values to substantially below 1974 Federal limits. Odor emissions were generally unchanged. Hydrocarbon and carbon monoxide emissions were substantially reduced in comparison with non-turbocharged vehicles, while nitrogen dioxide emissions were increased. The impact of increased nitrogen oxides from both kits was negligible.

55876 **APTIC NO. 80969**

Standrod, S. E., Jr. and J. P. Dodt

REFUSE MANAGEMENT THREE FORMS OF BURNING FOR ENERGY RECOVERY. *Rust Engineering Co., Birmingham, Ala., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 416-421. 1 ref. (Nov. 3-5.)*

The environmental effects of three methods of burning solid waste are compared. They are mass burning, semi-suspension firing, and full suspension firing. Assuming the proper application of gas and wastewater cleaning devices and systems, all three can be designed to meet the most stringent air and waste codes and regulations in effect today. Residue from the mass burning system is sterile and can be used for a number of purposes. The residue from precombustive separation processes contains sufficient putrescibles to require disposal in a sanitary landfill. Post-combustive residues from the suspension and semi-suspension fired systems contain sufficient combustible and putrescible material as to require disposal by landfilling also. The post combustive aggregate from the mass burning process can be washed and screened for use in asphalt, concrete block, or road base material. Fly ash from any of the systems can be recovered for possible use as a cement supplement.

55877 **APTIC NO. 80909**

Steimle, F.

THE APPLICATION OF HEAT PUMPS FOR WASTE HEAT UTILIZATION AND ENERGY SAVING. *(Der Einsatz von Waermepumpen zur Abwaermeverwertung und Energieeinsparung). Text in German. VDI (Ver. Deut. Ingr.) Ber., (236):201-206, 1975.*

Theoretical and practical considerations on compression and absorption heat pumps for waste heat utilization are presented. Groundwater, surface water bodies, rivers, and the ground can be considered as potential energy sources for heat pumps. Heat pumps are especially suitable for space heating by the recovery of waste heat from exhaust air with small differences between the inside and outside temperatures, and when high-temperature waste heat, generated in many technological processes, is to be recovered for use at a low temperature level. The coefficient of performance of heat pumps should always be above 3 to be economical.

55878 **APTIC NO. 73315**

Sugimoto, Takashi

PRESENT STATUS OF AND FUTURE PLANS FOR POLLUTION CONTROL FACILITIES. *(Kogai boshi taisaku shisetsu no genkyo to kongo no keikaku). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Control, Japan), 28(90):37-40, Jan. 1975.*

Pollution control measures at the Ebetsu Kraft Pulp Mill, Hokkaido, Japan are described. Emission levels of pollutants (sulfur oxides, nitrogen oxides, particulates, SS, BOD (biological oxygen demands), and PH) have been reduced to meet emission standards. Emission levels of malodorous gases have been reduced by 90%, but sensibility to malodors has only been reduced by half. It seems that at present technological levels, malodors are not going to disappear overnight. New installations, such as an evaporator-condensate-steam-stripping installations, are in future construction plans for further pollution abatement. Noise countermeasures are also being planned.

55879 **APTIC NO. 73395**

Suzuki, T.

COUNTERMEASURES AGAINST ODOR IN KRAFT PULP FACTORIES. *(Kurafuto parupu kojo ni okeru shuki taisaku ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(3):230-239, 1975.*

Odor countermeasures in Kraft pulp (KP) factories in Japan and at the Escanaba, Michigan KP factory of Mead Co. are discussed. In the Kraft pulp process, nearly 50% of odors arise from the collection boiler system. Malodors which require treatment include hydrogen sulfide, methyl mercaptan, and methyl sulfide. Major areas of odor control in KP factories in Japan are: collection and combustion (thermal decomposition) of malodorous gases; oxidation of black liquid (stabilization of sodium sulfide; deodorization of malodorous waste water (stripping); use of low-odor boilers; and masking and absorption of odors. Present-day technologies may impose a limit on the degree of attainable odor control. In the Escanaba plant, the most advanced technologies, gathered from world-wide sources, were incorporated in building a model KP factory which met stringent requirements (e.g., H2S emission must be below 3 ppm) set by the Michigan Atmospheric Pollution Control Council. By meeting the anti-pollution requirements, and by acting as a good neighbor with its open policy in handling pollution complaints and problems, Mead Co. has been welcomed in the region.

55880 **APTIC NO. 73274**

Takamaru, Tomio

TREATMENT FACILITY FOR ODOROUS AIR CONTAINING GASES WITH A LARGE SPECIFIC GRAVITY SUCH AS TRICHLOROETHYLENE. *(Torikuren to hijyu no dainaru jyochatsu seibun o inyu suru ishukitai no shorishochi). Text in Japanese. (Assignee not given.) Japan. Model Util. Sho 50-10448. 2p., April 2, 1975. 2 refs. (Appl. Jan. 11, 1969, 1 claim).*

A device to remove a hot vapor of large specific gravity such as trichloroethylene from air is described. The equipment is intended to remove trichloroethylene vapor generated during the process of iron painting in which trichloroethylene is used to pretreat the iron before coating; hot trichloroethylene vapor is discharged into the atmosphere producing odor. The generated hot trichloroethylene vapor is mixed with air and bubbled through a water bath. The hot vapor is condensed upon the contact with water and precipitated at the bottom of the bath; the precipitation can thus be re-used. The air bubbles then emerge from the water bath and it is further cleaned by water spray before discharge to the atmosphere. The water used in the bath is recirculated. The apparatus can be used for removal of hot vapor from any compound with large specific gravity.

55881 **APTIC NO. 80931**

Takeuchi, Takashi

POLLUTION CONTROL BY DAIDO STEEL CO., LTD. *(Wagasha no kogai taisaku-Daido seiko). Text in Japanese. Chuko to Tanko (Cast. Forg. Steel), no. 268:12-17, Nov. 1975.*

The pollution control program of the Daido Steel Co., Ltd., which has 7 processing plants and one research institute, is described. The control program at steel manufacturing plants concentrates on the dust generated by the melting processes. A gas cooling method, a dust aspirating method, and a carbon monoxide incineration method are used to control dust. Other goals of the control program are control of sulfur dioxide, nitrogen oxide, and dust generated from heating of the materials for steel manufacturing, for which the following methods and devices are employed: an automatic exhaust emission control and exhaust TV monitoring for dust control, elevated chimneys and the use of heavy oil and kerosene fuels for SO2 control, and research and development of low nitrogen oxides burners for NOx control. The expenditure for pollution control is $14/ton of steel material, $30/ton of forged steel and $100/ton of cast steel. An economically feasible closed system is being considered for the future.

55882 **APTIC NO. 73222**

Tanaka, Yutaka and Yuzuru Shimamoto

STUDIES ON THE COMBUSTION EFFICIENCY IMPROVEMENT BY AIR INJECTION. *(Kuki funsha ni yoru nensho sei kaizen ni kansuru kenkyu). Text in Japanese. Nippon Kikai Gakkai Ronbunshu (Trans. Japan Soc. Mech. Engrs.), 41(341):325-333, Jan. 1975.*

An experiment was carried out to study nozzle tone characteristics, flame shape variation, stabilization and mechanism of combustion, and the extent of pressure variation for combustion improvement. High frequency agitation was applied to the combustion region by using eddy tone nozzles of various sizes. The method was effective for varying flame shape and improving and stabilizing combustion. The high frequency agitation decreased high frequency components of greater than 10 KHz near the nozzle but increased the frequency of components lower than 10 KHz and, as a result, the effective value of pressure wave near the nozzle was increased. For increasing combustion efficiency, a pressure variation of greater than 60 mm Ag was necessary. High speed photography showed that zigzag movement of combustion mass and vertical and horizontal movements near the burner port were responsible for increasing the combustion efficiency and stabilizing the combustion.

55883 **APTIC NO. 80945**

Tanner, R. K.

WILL THE CLASSICAL REFUSE INCINERATION METHOD OF REFUSE DISPOSAL BE SUPERSEDED BY PYROLYSIS? *European Environmental Enterprise, Zurich (Switzerland), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 214-219. (Nov. 3-5.)*

The environmental advantages of using pyrolysis for refuse disposal are discussed. The majority of pyrolysis processes produce combustible gas or oil instead of flue gas and the scrap recovered is clean. The apparent advantages are small quantities of gas, less emission of dust, the production of storable energy, and more readily salable slag or scrap. Pyrolysis produces less hydrogen chloride and sulfur dioxide than the classical refuse incineration process, due to their neutralization through the ammonia formed, although this is not substantiated through results obtained from a full scale installation.

55884 **APTIC NO. 73339**

Teshirogi, N. and K. Kontani

CONTROL OF EXHAUST EMISSIONS FROM DIESEL ENGINES. *(Diizeru kikan no haishutsu gasu taisaku). Text in Japanese. Kuki Seijo (Clean Air - J. Japan. Air Cleaning Assoc., Tokyo), 12(6):32-45, Feb. 1975. 4 refs.*

Control measures for pollutant emission from diesel engines are reviewed with some experimental data. Based on the combustion process and exhaust emission mechanism of diesel engines the emission control measure is classified into three categories: pretreatment concerning fuel intake and combustion, modification of the engine itself, and after treatment of exhaust gas. All the factors affecting exhaust emission are reviewed with a chart. Experimental results on exhaust gas recirculation (EGR) particularly effective for nitrogen oxides control are given with descriptions of experimental apparatus and procedures and data on the relationships between EGR and emission concentration of nitric oxide, hydrocarbons, carbon monoxide, and carbon, EGR and specific emission quantity, NO emission quantity and fuel consumption rate, comparison with emission standards, variations in HC, CO2, and CO, fuel consumption rate with nitrogen and CO2 dilution in EGR, and indicator diagrams in the case of N2 and CO2 dilution. The effects of delayed fuel injection timing and water injection methods are described with experimental data. The combined use of EGR and water injection method is also discussed.

55885 **APTIC NO. 80999**

Thomas, George A. and John R. Holmes

THE CHOICE BETWEEN RECLAMATION AND THE RECOVERY OF ENERGY FROM REGUSE. *South Yorkshire County Council (England), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 164-172. (Nov. 3-5.)*

The economic and social consequences of waste disposal reclamation and energy recovery problems faced by the waste disposal authority in an industrial county in the North of England are examined. All methods of waste disposal are in the end landfill and the choice rests in selecting the level of capital cost, operating cost, pollution risk, and environmental impact of the various systems. These systems cover a spectrum between simple sanitary landfill of untreated domestic refuse through various transfer station and bulk haul alternatives to the high capital cost of thermal systems such as incineration. It is economically and environmentally feasible in areas such as South Yorkshire with an established pattern of heavy industry using coal as a primary fuel to direct a waste disposal strategy towards the use of domestic refuse or its constituents as a supplementary fuel. Plastic/paper fuel pellets can form up to a 20% supplement in conventional boilers. The pellets are low in ash 10%, chlorine (0.2-1.0%, and sulfur (0.2%).

55886 **APTIC NO. 79964**

Todo, Naoyuki and Akifumi Ueno

PRESENT STATUS OF DENITRIFICATION BY CATALYSIS AND COMING PROBLEMS. *(Shokubai ni yoru haien dassho gijutsu no genkyo to kongo no kadai) Text in Japanese. Kogai To Taisaku (J. Pollution Control), 11(10):1107-1113, 1975. 18 refs.*

The present status of development of nitrogen oxides contact reduction methods is discussed, with emphasis on ammonia reduction processes. Since 1973, some 33 Japanese patents have been disclosed, concerning ammonia reduction with various catalysts. Denitrification of clean flue gas (no sulfur oxides; little dust) b ammonia reduction has been conducted for nearly one year at an installation handling 200,000 N cu m/hr. Over 90% denitrification, was obtained with catalyst life of more than 1 yr. One advantage o the ammonia process is its ability to reduce NOx to nitrogen in the presence of oxygen. Reduction occurs at oxygen concentrations from 1-4% to 10-15%. When flue gas contains SOx, secondary pollution products such as carbonyl sulfide and hydrogen sulfide are not formed, but a decrease in catalyst activity occurs. Excess NH3 (NH3 nitric oxide greater than 1) causes deterioration of ferric oxide, vanadium pentoxide-alumina catalyst systems. Excessive formation of ammonium sulfate and NH4HSO4 also occurs, reducing the effective rate of heat exchange. Catalysts in a ring-shape have been used to reduce adverse effects of dust. For Fe203 catalysts, 95% denitrification occurs at space velocity 3000/hr and reaction temperature 400-420 C after prolonged use. Catalysts can be packed between mesh sandwiches, and installed vertically parallel to each other, to eliminate pressure loss from dust buildup. Denitrification catalysts should be developed for low temperature use that are able to handle sulfur dioxide concentrations of 50-100 ppm in the residual flue gas, after an initial wet-type desulfurization treatment.

55887 **APTIC NO. 80948**

Tolman, Radon

SOLID WASTE GASIFICATION. *ENRECON, Inc., Denver, Colo., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, 6p. 1 ref. (Nov. 3-5.)*

The environmental and energy advantages of a fluidized bed refuse gasification system are described. The fuel use of organic materials in refuse requires processes which are insensitive to the chemical properties of the feed material (coal, solid waste, refuse, waste liquids), that meet environmental regulations concerning nitrogen oxides, particulates, and trace elements, that permit higher overall power plant operating efficiencies than competitive systems, and that are economical to build and demonstrate reliability. Gasification or liquefication of organic materials before combustion allows more efficient cleanup of particulates and other objectionable emissions than stack gas cleanup after combustion. A thermal penalty of up to 20% can be offset by the use of cheap fuels, combined cycles, and environmental advantages. Capacity, corrosion, erosion, and reliability problems associated with direct combustion can be avoided. A model fluidized bed refuse gasification system is described.

55888 **APTIC NO. 73278**

Toyoda, Riichi and Katsuhiko Motosugi

A WATER JET CARBURETOR FOR INTERNAL COMBUSTION ENGINES. *(Nainenkikan no mizu funsha kikaki). Text in Japanese. (Toyota Motor Co., Ltd., Toyota (Japan)) Japan. Pat. Sho 50-6893. 3p., March 19, 1975. (Appl. Feb. 26, 1971, 1 claim).*

A carburetor equipped with a water mixing device for internal combustion engines is described. Water is mixed with fuel before entering the intake manifold, and it is connected through a water tank by a tube which has three control valves for water flow. The first valve is related to the sensor for engine temperature, and when the engine is hot, the valve opens, permitting water to flow through the tube. The second valve is operated through the pressure of the intake manifold, and opens more allowing the flow of extra water when the pressure of the intake manifold is low. The third valve is connected to an acceleration pump, and when the engine is accelerating, the valve opens even more to allow extra water to flow through. Therefore the combination of these three valves regulates the quantity of water being mixed with fuel and keeps nitrogen oxides emissions from the engine low without decreasing engine performance.

55889 **APTIC NO. 73302**

Tsuchiya, Koichi

RESULTS OF TEST OPERATIONS AT FLUE GAS DESULFURIZATION PLANT AT MIZUSHIMA POWER STATION, NO. 2 UNIT. *(Mizushima hatsudensho dainigo-ki haien datsuryu sochi shiunten kekka). Text in Japanese. Karyoku Genshiryoku Hatsuden (Therm. Nucl. Power), 26(1):9-24, Jan. 1975.*

Detailed results of test operations from November 1973 to April 1974 at the flue gas desulfurization plant at Mizushima Power Station, No. 2 Unit, Japan, are described. Plant construction (covering about 2500 sq m) was a joint venture of Chugoku Electric Power Co., Hitachi Manufacturing Co., and Babcock-Hitachi Co. This wet-process (limestone-gypsum method) desulfurization unit for Power Plant No. 2 (output, 156 MW), has a gas treatment capacity of 310,000 N cu m/hr (adequate for 100 MW). Over 90% of the sulfur was removed, when 500 ppm of sulfur dioxide was introduced into the installation. Sulfur dioxide concentration of 1000 ppm can be treated. Entry gas temperature was 140 C; exit gas temperature was 120 C. Dust emission was less than 50 mg/N cu m; amount of gypsum formed as by-product was 34 tons/day. Slurry accumulation in the desulfurization tower was eliminated by a change in the design of the slurry removal section. Clogging of sulfuric acid carrier pipes in the gypsum system was corrected by decreasing sulfuric acid concentration from 98% to 95%. Scale formation in the desulfurization tower was negligible; scale formation on fan blades was corrected by modifying operating conditions. Leakage at knife-gate valves in the slurry system was corrected by making processing changes; there were no problems with worn-down valves.

55890 **APTIC NO. 80941**

Tsutsumi, Shigeru

THERMAL AND STEAM CRACKING OF WASTE PLASTICS. *Osaka Univ. (Japan), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 567-572. (Nov. 3-5.)*

A process for the desulfurization of sulfur-rich asphalts is described. Khafuji asphalt with 6% sulfur was subjected to cracking at 500-550 C and 500 m mercury. About 55% of the product was distilled oil, with 20% carbon and 15% gas; the total material balance was 92%. The sulfur content of the distilled oil was 2.2% and almost all the S of the sample was concentrated in the carbon deposited. The asphalt was mixed with polyethylene in a ratio of 1:1, and subjected to cracking. The S content of the distilled oil obtained was decreased from 2.2% to 1.1% and the yield of distilled oil was 170%, based on the asphalt used.

55891 **APTIC NO. 80652**

Vanderhoff, J. W.

ECOLOGICAL ASPECTS OF WASTEPAPER RECYCLING. *Preprint, Lehigh Univ., Bethlehem, Pa., National Printing Ink Research Inst., 8p., 1975. 26 refs.*

Several types of the solventless inks developed to avoid pollution of the atmosphere by solvent emission give trouble in the wastepaper recycling processes currently used in the United States. They form particles 50 to 100 micron in diameter that cannot be removed from the fiber suspension by washing. These papers can be recycled satisfactorily using a sodium peroxide recipe. (Author abstract)

55892 **APTIC NO. 80817**

Vannice, M. A.

THE CATALYTIC SYNTHESIS OF HYDROCARBONS FROM H2/CO MIXTURES OVER THE GROUP VIII METALS. III. METAL-SUPPORT EFFECTS WITH PT AND PD CATALYSTS. *J. Catalysis, 40(1):129-134, Oct. 1975. 21 refs.*

The catalytic behavior of supported Group VIII metals was investigated. Platinum and palladium on various supports and with different particle sizes were compared. All supported catalyst samples were characterized by carbon monoxide chemisorption, and hydrogen chemisorption when possible, to measure metal surface areas and determine metal dispersion values. Kinetic data were obtained from a differential flow reactor, operated under steady state conditions, where CO conversions were maintained at very low levels, normally between 0.2 and 2%. The support itself can alter the catalytic activity of the metal component dispersed on its surface. This effect may be indirect, as in the case of Pt, where the primary role of the support is to produce stable highly dispersed Pt clusters which have a higher specific activity than very large Pt crystallites. A direct interaction between metal and support, quite possibly involving electron transfer, appears to exist with Pd catalysts that is relatively independent of metal particle size, at least when the Pd crystallites are about 100 angstroms or less. The nature of the support itself, rather than variations in metal particle size, produces the greatest change in specific activity in this case. (Author abstract modified)

55893 **APTIC NO. 80991**

Willerup, Ole H.

EXPERIENCES WITH A PYROLYSIS PLANT FOR MUNICIPAL AND INDUSTRIAL REFUSE. *Pollution Control Ltd., Copenhagen (Denmark), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 325-330. (Nov. 3-5.)*

A pyrolysis plant using the Destrugas process for municipal and industrial refuse is described. Neither air nor oxygen is supplied to the garbage during the process. There is no combustion stage; it is pure gasification. The resulting products, pyrolysis char and gas, are both removed in the bottom of the retort. Consequently, the gas is free from tar and heavy hydrocarbons. The gas is washed in a wet scrubber, and some part of the gas is used for heating the retorts, while the surplus gas in the pilot plant is flared. By wet scrubbing the gas is purified from its content of dust and impurities, mainly sulfur dioxide and hydrogen chloride. These impurities are dissolved in the wash water and neutralized because there is a surplus of ammonia in the gas, from the proteins in the garbage.

55894 **APTIC NO. 80917**

Wolf, Friedrich, Werner Hoese, and Helmut Fuertig

SORPTION OF HYDROGEN SULFIDE AND METHYL MERCAPTAN ON ZEOLITHIC MOLECULAR SIEVES. *(Zur Sorption von Schwefelwasserstoff und Methylmercaptan an zeolithischen Molekularsieben). Text in German. Chem. Tech. (Berlin), 27(6):362-364, June 1975. 31 refs.*

The steady-state adsorption capacity of synthetic type A and X zeolithic molecular sieves for hydrogen sulfide and methyl mercaptan was studied by means of BET apparatus. The adsorption capacity of ion-exchanged type A molecular sieves for H2S increased in the following order: barium-A, potassium-A, strontium-A, cobalt-A, nickel-A, zinc-A, manganese-A, sodium-A, magnesium-A, and calcium-A. A similar order was established also for methyl mercaptan. The adsorption capacity was highest on CaA type molecular sieves at ion-exchange degrees of 47.6 and 64%, where a maximum of ion diffusion velocity was observed. The adsorption capacities for both H2S and methyl mercaptan were somewhat higher on NaX and KNaX than on the corresponding type A molecular sieves. However, they are only more efficient than the CaA molecular sieves at lower temperatures and under higher H2S partial pressures. The type X molecular sieves are recommended for higher-boiling disulfides, mercaptans, and cyclic compounds.

55895 **APTIC NO. 79965**

Yamada, Mitsumasa and Yoji Kitamura

SECONDARY AIR SUPPLY UNIT FOR EXHAUST GAS PURIFICATION EQUIPMENT. *(Haiki gasu joka sochi no niji kuki kyokyu sochi). Text in Japanese. (Nippon Denso Co., Ltd., Kariya City (Japan) and Toyota Automotive Industries, KK, Toyota City (Japan)) Japan. Model Util. Sho 50-28266. 4p., Aug. 21, 1975. 1 ref. (Appl. Dec. 26, 1970, 1 claim).*

Improvements in the structure of secondary air supply units for exhaust gas purification equipment for internal combustion engines are described. A reaction chamber is installed along the exhaust pipe, and by addition of secondary air to the exhaust gas, toxic, unburned components in the exhaust are oxidized and made innocuous through catalytic reactions. Heat breakdown of the catalyst is prevented by the following means: The exhaust pipe is double-walle on the intake side of the reaction chamber; secondary air is supplied in between the two walls, heated by the exhaust gas, and reacts with the exhaust gas in the catalytic chamber; heat is generated as catalytic action progresses to produce carbon dioxide and water, but the cooler exhaust gas served to keep the temperatur down. In high load, high speed situations, a temperature sensor in the catalytic chamber activates a magnet, which closes the valve through which secondary air is mixed with exhaust gas. Air is take in between the walls, and exhausted into the atmosphere, through a port that had been closed at lower temperatures. Exhaust gas is cooled, but in the absence of air, undergoes very little reaction i the catalytic chamber. The temperature of the catalytic layer remains low enough to prevent decomposition.

55896 **APTIC NO. 73425**

Yamagoshi, Ryoichi

COUNTERPLAN FOR REMOVAL OF SULFUR OXIDES: AN EXAMPLE IN STEEL INDUSTRY. *(Iou sankabutsu jyokyo taisaki: tekko-gyo ni okeru ichi rei). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(4):319, 1975.*

The sulfur oxides emission by the Kawasaki Iron Manufacturing Co. at the Mizushima and Chiba factories must be reduced to 60% of the present level by March 1978 to meet the scheduled areal emission law (0.04 ppm SOx daily average). The reduction of SOx emission has been attempted by using a higher chimney, low sulfur fuel, and low sulfur ore; however, these measures are not sufficient to meet the tighter emission law, and the installation of desulfurization equipment for flue gas is essential. About 70% of the ore used in the iron manufacturing company is treated at its sintering factory in which 300 to 600 ppm SOx is found in the flue gas. The emission rate of flue gas at the sintering factory is 500,000 to 1,500,000 cu m/hr. The Mizushima factory installed four desulfurization facilities for its sintering factories. The installation of such a facility is also scheduled at the Chiba Factory. The method used (lime) achieved better than 90% desulfurization efficiency with only a few maintenance problems such as pipe clogs. Desulfurization for coke oven gas has also been considered and the installation of an ammonia method desulfurization facility is scheduled for the near future.

55897 **APTIC NO. 80944**

Yamamoto, H.

THE WET SCRUBBING SYSTEM FOR THE FLUE GAS OF A MUNICIPAL REFUSE INCINERATOR AND THE TREATMENT OF THE WASTE WATER. *Seitetsu Kagaku Co., Ltd., Osaka (Japan), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st Montreux, Switzerland, 1975, p. 202-207. (Nov. 3-5.)*

A wet scrubbing system for the flue gas of a muncipal refuse incinerator is described. The temperature of the exhaust gas is 300 C after it passes through an electric precipitator. It enters into a quenching section to be cooled to 80 C, then to the scrubber to remove harmful substances such as hydrogen chloride, sulfur oxides, nitrogen oxides, and dust. The purified exhaust gas goes into a dehumidification tower to be water-cooled. The gas is heated to cut white smoke.

55898 **APTIC NO. 73345**

Yamamoto, Seitetsu and Masashi Yamada

AN AFTER-BURN PREVENTING DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Nainenkikan no afuta ban boshi sochi). Text in Japanese. (Toyo Kogyo Co., Hiroshima (Japan)) Japan. Model Util. Sho 50-4899. 3p., Feb. 10, 1975. (Appl. March 18, 1971, 1 claim).*

A prevention apparatus for after-burn in automobile engines is described. Supplemental air from an air pump is split into two streams by a valve operated by a diaphragm. One of the streams goes to the exhaust pipe, and the other is split further into two, one of which goes out to the atmosphere and the other of which goes into the intake manifold of the engine. The diaphragm is connected to the intake manifold through a vacuum line. When the automobile is in deceleration, the valve closes the air stream to the exhaust pipe and allows the air to flow the other way. When the automobile is in either acceleration or idling, the valve opens the air stream to the exhaust pipe and closes it to the other. Only part of the air is flown into the intake manifold and the rest of it is discharged into the atmosphere when the air stream is closed to the exhaust pipe. The amount of air being supplied into the intake manifold is regulated by the diameter of the tube directed to the manifold. A solenoid switch can be used for the valve control instead of the diaphragm.

55899 **APTIC NO. 73202**

Yanagihara, Shigeru

REVIEW OF AUTOMOTIVE EMISSION CONTROL PROBLEMS. *(Jidosha haigasu taisaku no mondaiten). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(6):2-10, Feb. 1975. 4 refs.*

The status of technology of automotive emission control systems is surveyed. Regulations, energy problems, exhaust purification for passenger vehicles and diesel engines, and otherr problems are discussed. Descriptions of various automotive engines and exhaust purification systems (FORD, GM, Honda CVCC, Mazda CEAPS) are given.

55900 **APTIC NO. 80759**

Yoshida, Masakazu and Hiromi Shimo

FOUR V-U ENGINE FOR TOYOTA CENTURY. *(50 negata century tosai 4V-U gata engine). Text in Japanese. Toyota Gijutsu (Toyota Eng.), 24(4):530-540, July 1975.*

A newly developed 4V-U V-8 engine is described. The 1975 model V-8 engine has an exhaust capacity of 3376 cc and a maximum output of 170/5400 (PS/rpm), consuming 225/3600 (g/PH h-rpm) of fuel. The exhaust control techniques employed for the engine include secondary air combustion, catalytic oxidation, exhaust gas recirculation, and an ignition time control device. Secondary air is supplied to the exhaust port and recombustion of hydrocarbon and carbon monoxide is promoted. Exhaust gas is recirculated from the branch portion of the no. 8 piston of the exhaust manifold through an EGR valve to the intake manifold. Ignition time is controlled by a water-temperature sensor and a negative pressure delay valve. An overheat prevention device for the catalyst is used to control the temperature of the catalytic converter, and heat resistant materials are used for better performance. The average carbon monoxide, hydrocarbon, and nitrogen oxides concentrations in the exhaust gas were 0.5 g/km, 0.17 g/km, and 1.15 g/km, respectively. The reduction of CO and HC was more than 90% while that of NOx was 45%, compared to a previous 1973 model.

55901 **APTIC NO. 80989**

Zulver, Elliot and Edsel D. Stewart

A FULL SCALE REFUSE PYROLYSIS SYSTEM FOR BALTIMORE, MARYLAND. *City of Baltimore, Md. and Monsanto Enviro-Chem Systems, Inc., LANDGARD SYSTEMS, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 238-243. (Nov. 3-5.)*

The exhaust gas system in a full scale refuse pyrolysis system for Baltimore, Md. is described. The waste gases are cleaned of particulate matter in a water scrubber, dehumidified, cooled, combined heated ambient air and discharged to the atmosphere. Solids are removed from the scrubber water system by diverting part of the recirculated water to a thickener, a tank where the solid material is allowed to settle out. Flocculent is added to aid in solids removal. The clarified thickener overflow is recycled to the scrubber while the underflow steam containing the settled solids is used as a coolant in the residue quencn tank. The cooler scrubber water system is a closed loop requiring very little makeup water. The plant is designed to allow the afterburner gases to bypass either or both of the boilers and enter the scrubbing tower directly. Recovery of the energy and material resources of municipal solid wastes is discussed.

55902 **APTIC NO. 73251**

REMOTE HEAT. *(Fernwaerme als Aufgabe). Text in German. Arch. Tech. Messen., no. 3:R46-R48, March 1975.*

The state of the art and perspectives of remote heat supply in West Germany are outlined. Remote heat offers substantial environmental advantages by the use of waste heat from conventional and nuclear power plants, such as reduced fuel consumption, reduced thermal pollution, and reduced pollutant emission from households whose specific emission is about three times that of power plants. Fluctuations in demand can be smoothed out by the installation of storage facilities near the consumers in urban agglomerations. Presently, every 16th household has a remote heat supply, which implies the saving of 5,000,000 tons of fuel oil yearly. It would be possible to supply every third household with remote heat, which could account for a saving of 12,000,000 tons of fuel oil yearly.

55903 **APTIC NO. 73341**

Environmental Agency (Japan), Atmospheric Div.

PRESENT DEVELOPMENTS IN EMISSION CONTROL TECHNOLOGY FOR NITROGEN OXIDES DISCHARGED FROM STATIONARY SOURCES. *(Kotei hasseigen ni kakaru chisso sanka butsu no haishutsu boshi gijutsu no kaihatsu jokyo ni tsuite). Text in Japanese. Kankyo Kenkyu (Environ. Studies), no. 9:74-86, March 1975.*

Different exhaust gas denitrification procedures utilized by eleven major Japanese industrial concerns are described: dry-type contact catalytic reduction with ammonia; wet-type oxidation- absorption with ozone, chlorine dioxide (ClO_2), and alkaline potassium permanganate; absorption with sodium sulfite-sodium acetate; and use of magnesium hydroxide and sodium sulfite. Desulfurization can be combined with denitrification in these processes. The use of exhaust gas recirculation, two-stage combustion, and low nitrogen oxides burners reduces NOx emission by 20-40%. Exhaust gas denitrification technology is almost practicable for boilers and furnaces and costs are comparable to desulfurization costs. As NOx emission control technology advances, emission standards should be strengthened accordingly.

55904 **APTIC NO. 73611**

Environmental Protection Agency, Ann Arbor, Mich., Emission Control Technology Div.

CHRYSLER BASELINE GAS TURBINE VEHICLE TESTS (JANUARY 74 - OCTOBER 74). *Preprint, 33p., Jan. 1975.*

A procedure developed for emission testing the Chrysler Baseline Gas Turbine is described along with results obtained over the 1975 Federal Test Procedure. The procedure which uses the test cell as a constant volume sampler appears to be a workable approach, and during the 1-hour period required for conducting the 1975 FTP, room air flow remained with + or - 10% of the initial value if room temperature variation was less than 20 F and barometric pressure remained constant. Plymouth Satellites equipped with the Chrysler sixth generation gas turbine engines coupled to an automatic transmission showed hydrocarbon, carbon monoxide, and nitrogen oxide emission levels over the 1975 FTP of 0.68, 3.51-3.77, and 2.72-2.86 g/mi, respectively, for engines operating with the diesel fuel (number 1 or 2) and 2.84, 2.28, and 3.14 g/mi, respectively, for engines operating with gasoline sulfate and particulate tests are inconclusive due to sampling problems.

55905 **APTIC NO. 80500**

DUST BURNS FREELY SUSPENDED. TRASH AND SEWAGE SLUDGE INCINERATION PLANT IN KREFELD TAKEN INTO OPERATION. *(Staub verbrennt freischwebend. Muell- und Klaerschlamm-Verbrennungsanlage in Krefeld in Betrieb genommen). Text in German. VDI Nachr. (Ver. Deut. Ingr.) (Berlin), 29(48):7, 1975.*

The new combined waste incinerator and wastewater treatment plant of the city of Frefeld, designed to incinerate 105,000 tons of wastes and 25,000 tons of sewage sludge, is described. The sewage sludge, dried and ground, is admitted to the incinerator together with the vapors generated in the drying and grinding process, and is incinerated freely suspended over the grate. The steam produced is used for electricity generation for the incinerator and wastewater treatment plant, and the exhaust steam is used for remote heating. The flue gases are dedusted in an electrostatic precipitator, after which they are washed in two stages for the removal of hydrochloric acid in the first stage, and of sulfur dioxide and hydrofluoric acid in the second. The cleaned gases are mixed with hot air before discharge into the atmosphere.

55906 **APTIC NO. 80587**

National Academy of Sciences, Washington, D. C., Commission on Natural Resources

STRATEGIES FOR CONTROLLING SULFUR-RELATED POWER PLANT EMISSIONS. SULFUR OXIDE EMISSIONS AND ABATEMENT TECHNIQUES. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 138-150, June 1975. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.)*

GPO

The generation of sulfur dioxide and sulfate emissions by coal-burning power plants is discussed along with various emission control techniques. More than 50% of the total anthropogenic sulfur oxide emissions produced on a nationwide basis are the result of the combustion of coal at power plants. Lime/limestone scrubbing appears to be the most effective near-term method for reducing flue gas sulfur dioxide emissions, with reductions of at least 90% being possible. A longer term approach to the sulfur oxide emission problem involves the conversion of sulfur dioxide into elemental sulfur and regeneration of the scrubbing liquor. The washing of high-sulfur eastern coals is capable of reducing their sulfur content by about 40%. Conventional phsyical cleaning, however, is not sufficient by itself to produce coals with a sulfur content meeting the New Source Performance Standards for sulfur oxides. The use of tall stacks and/or intermittent control systems is an economically attractive way of meeting ambient sulfur dioxide standards in carefully defined situations. However, this strategy does not decrease the total amount of sulfate in the regional atmosphere, and the potential for increasing ambient sulfate concentrations in downwind areas must be considered.

55907 **APTIC NO. 80640**

Energy and Environmental Analysis, Inc., Arlington, Va. and AVRAM Co., Falls Church, Va.

APPENDIX 7. AUTOMOTIVE SULFATE EMISSIONS. CONTROL OPTIONS. *In: An Analysis of the Automotive Sulfate Question, Manufacturers of Emissions Controls Association Contract, 45p., 1975. 12 refs.*

Control options for reducing sulfate emissions from automobiles equipped with catalytic converters are analyzed. Control levels in excess of 90% appear to be possible without significantly increasing the cost of emission controls, sacrificing fuel economy, or delaying the attainment of statutory standards for hydrocarbons and carbon monoxide. Primary control options include: changes in the catalyst formula (40% reduction), excess air control (50% reduction); gasoline sulfur control (60-80% reduction), and advanced emission control systems, including both dual and three-way catalysts which have sulfate emission characteristics comparable to non-catalytic systems. A combined strategy including both the control of vehicle design parameters and gasoline sulfur content is expected to result in at least 90% control of sulfate emissions. (Author summary modified)

55908 **APTIC NO. 80755**

ADVANCED CONCEPT IN ANTISMOG BURNER. *(Fortschrittliche Kozeption beim AntiSmog Brenner). Text in German. Oel Gasfeuerung., no. 9:36-37, 1975.*

The AntiSmog burner developed by Oechssler Cuenod is described. The new burner used water-in-oil emulsion in the case of heavy fuel oil, and water injection in the case of extra-light fuel oil. It is possible to use oils with a minimum viscosity of 2 Engler at 20 C. Due to the use of water, it is possible to reduce the particulate emissions by 95%, and the sulfur trioxide formation to 50%, and to increase the carbon dioxide content in the flue gases to 13.5%. The heat transfer to the boiler was improved by 4%, and the efficiency increased by 2%. The fuel economy may amount to 10%. Flue gas turbidities ranging from 0 to 1 on the Bacharach scale were measured on an experimental burner used for heat supply in an apartment house with 752 units.

1974

55909 **APTIC NO. 73531**

Ahonen, Aki

THEORETICAL ASPECTS OF INCREASING THE SULPHUR DIOXIDE ABSORPTION EFFICIENCY IN RECOVERY PLANTS FOR MAGNESIUM BISULPHITE SPENT LIQUOR CHEMICALS. *Pap. Puu, 56(8):619-622, 1974. 4 refs.*

Possibilities for increasing sulfur dioxide absorption in magnesia slurry scrubbers serving sulfite pulping mills are discussed. Increasing the pH of the absorption liquor in the last stage by one unit can reduce SO2 losses by 90%, although pH increase is limited by the solubility of magnesium monosulfite in the system. The highest pH value which can be used in the last absorption stage when the total SO2 concentration is 3% is about 6.8 at 65 C; values over this limit result in plugging of the absorber as a result of magnesium monosulfite precipitation. The total SO2 concentration in the last absorption stage must be kept low to attain high pH values and minimal SO2 loss. Problems caused by high SO2 concentrations in the last stage can be diminished by circulating the SO2-containing water from the cooling stage to some off the earlier stages.

55910 **APTIC NO. 80414**

Ashworth, Robert A. and Carl A. Bolez

CLEAN CONVERSION OF COAL TO ELECTRIC POWER - A DOLLAR AND CENTS APPROACH. *Public Util. Fortn., 93(6):36-42, March 14, 1974.*

Various techniques for the generation of electric power from coal are reviewed in terms of their near-term and long-term technical and economic feasibility. Direct combustion of coal with stack gas desulfurization is expected to supply the bulk of the near- term electrical power generated from coal. Federal nitrogen oxide emission levels can generally be met by proper boiler design and coal-firing technique. The direct combustion of coal in fluidized bed boilers is another presently available technique. This method is particularly useful for NOx reduction due to the relatively low boiler operating temperatures. The production of low Btu gas from coal is presently possible, although the process is not yet proven for the gasification of caking coals without first going through a pretreatment step. Low Btu gas with a conventional combined cycle set-up appears to be the best economic choice for implementation by 1978. Low Btu gas used in advanced combined cycles appears to be the best economic choice by 1988, followed by the use of supercharged fluidized bed boilers. Coal liquefaction appears to be the most expensive method of generating electrical power.

55911 **APTIC NO. 79915**

Baardson, Andrew B.

WOOD WASTE BURNER SYSTEM. *(Mill Conversion Contractor, Inc., Hillsboro, Oreg.) U. S. Pat. 3,831,535. 15p., Aug. 27, 1974. 6 refs. (Appl. Nov. 2, 1973, 15 claims).*

A system for the effective utilization of wood waste material and other by-products of the lumber mill industry is described. The wood waste is reduced to a dry powdery form so that it can be used as a fuel. It is fed to a unique dual chambered burner to which th fume emissions are fed. The wood and fumes are fired and burned to produce a substantial amount of heat. The products of combustion are fed to a unit that separates out the impurities. A portion of the clean hot gases is directed to the dryer from which the fumes are channeled back to the burner. This system reduces are pollutio and provides an alternative to expensive propane and natural gas.

55912 **APTIC NO. 73646**

Balakrishnan, N. S. and Thomas F. Robinson

A CORROSION ANATOMY OF FLUE GAS CLEANING SYSTEM FOR COAL FIRED BOILERS. *Preprint, American Inst. of Chemical Engineers, New York, 23p., 1974. 4 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 77th, Pittsburgh, Pa., June 1974.)*

Corrosion studies of a pilot flue gas cleaning system for coal-fired boilers were performed. The system consisted of a cocurrently sprayed venturi scrubber for the removal of particulates prior to sulfur dioxide absorption and a countercurrent fixed bed absorber using limestone slurry for SO2 removal. Pitting and deterioration of the rods in the particulate scrubber was extensive wherever the fly ash buildup occurred due to nozzle plugging. The access door in the dry-wet zone between the spray pipe and rods also showed a high degree of deterioration and pitting. Experience indicated that the inlet box must be constructed of a high nickel content metal such as Hastelloy G and that the rods must be made of ceramic material for good corrosion resistance. The rest of the scrubber can be made of carbon steel with an abrasion and corrosion resistant polyester lining. The testing of various materials in the SO2 absorber revealed that Inconel 625 was essentially unaffected in the preclean section. In the recycle tank all stainless steels and higher alloys, except for Type 430 stainless steel, appeared to be unaffected. Below the venturi rods, pitting attack of non-moly stainless steels was severe; Incoloy 825 and higher moly alloys were quite resistant, however. Types 216 and 316 stainless steels and all the higher moly alloys were quite resistant for use between the absorber rod beds. The higher molybdenum alloys as well as Type 216 stainless steel were also resistant to pitting attack in the exhaust duct after the second set of demister vanes. Type 316 stainless steel was deeply pitted on one specimen, indicating definite borderline resistance in this location.

55913 **APTIC NO. 80686**

Boehman, L. I. and J. E. Davison

REFRACTORY METALS FOR ADVANCED GAS TURBINE ENGINES FOR COMBINED CYCLE POWER PRODUCTION. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Am. Inst. Chem. Engrs. Air Pollution Control Assoc. Proc. 2nd Natl. Conf. Energy Environ., College Corner, Ohio, 1974, p. 62-67. 15 refs. (Nov. 13-15.)*

Operating variables and construction materials favoring increased thermal efficiency of combined cycle generating systems utilizing gas turbine engines whose exhaust gases are combusted in a steam boiler are reviewed. Refractory metal alloys whose primary constituent is molybdenum or tungsten can be utilized in high temperature gas environments of turbines without occurrence of oxide formation by modifying the composition of the gaseous phase to produce a reducing environment. The formation of soot can be avoided by the proper control of combustion conditions and by maintaining the temperature of the gaseous phase after expansion through the turbine above 1100-1200 F. The adjustment of excess air for the second stage of combustion at 15% insures that no carbon monoxide is present in the flue gas.

55914 **APTIC NO. 73258**

Breelle, Y.

UTILIZATION OF HYDROGEN CELLS IN URBAN TRANSPORTATION. *(B-2-5- Utilisation des piles a hydrogene en traction urbaine). Text in French. Preprint, Societe des Ingenieurs de l Automobile, Paris (France), p. 299-306, 1974. (Presented at the Congres International FISITA, XV, Paris, France, May 13-17, 1974, Paper B-2-5.)*

The possibilities and perspectives of the use of hydrogen fuel cells in vehicles are outlined. Vehicles to be equipped with hydrogen cells should be designed for four passengers and 80 kg luggage, and should not be limited to urban traffic only. Using hydrogen under 200 bar pressure, it is possible to achieve a specific capacity of 225 Wh/kg, and 290 Wh/kg is rated as realistic in the near future. When carrying 2-liter hydrogen, the range of the vehicle would be 235 km at a cruising speed of 80 km/hr, and 550 km at a speed of 35 km/hr. The range can be considerably increased by increasing the hydrogen storage capacity. The higher price of hydrogen cell-equipped cars as compared with conventional automobiles is compensated by reduced fuel costs.

55915 **APTIC NO. 73603**

Brinsko, George A.

SLUDGE DISPOSAL BY INCINERATION AT ALCOSAN. *Preprint, 22p., 1974. 3 refs. (Presented at the Municipal Sludge Management National Conference, Pittsburgh, Pa., June 12, 1974.)*

A sewage sludge disposal system operated by the Allegheny County Sanitary Authority is described, with particular emphasis on the control of air pollutant emissions. Final disposal of sludge solids is accomplished in one or more of four flash-drying incinerators where sludge particles are dried in suspension in a stream off hot gases. Gas-borne particles are carried to cyclone separators, and malodorous gases are drawn into a deodorizing section of the furnace for destruction. The secondary treatment facilities utilize a step-aeration activated sludge process. A mixture of raw and waste-activated sludge solids at a concentration of 5% are pumped from primary sedimentation tanks through disintegrators into mixing tanks where slow speed mixers insure a homogeneous mixture prior to sludge conditioning by polymer application. The sludge is then pumped to vacuum filters. The dewatered sludge is then carried to incinerators, and the incinerator ash along with residue from venturi scrubbers is settled in ash settling tanks. The ash is hauled to a sanitary landfill. Hydrogen peroxide addition to the sludge to eliminate existing odor problems appear to be effective, though it may not be economically competitive with alternative odor controls. Redesign of the exhaust system to duct foul gases from the vacuum pumps into the incinerators for final destruction is underway.

55916 **APTIC NO. 80377**

Cain, William S. and Milton Drexler

SCOPE AND EVALUATION OF ODOR COUNTERACTION AND MASKING. *Ann. N. Y. Acad. Sci., vol. 237:427-439, 1974. 20 refs.*

An evaluation of odor counteraction and masking techniques is reported. Adult subjects estimated the perceived magnitude of various concentrations of pyridine, linalool, linalyl acetate, lavandin oil, a half-and-half mixture of linalyl acetate and linalool, and mixtures of pyridine and each of the other substances. The perceived intensity of a mixture was never as large as the sum of the intensities of its components but instead fell between the intensities of the components. The weaker component appeared to counteract (reduce) the odor of the stronger component. The odor quality of the stronger component, however, predominated in the mixture and sometimes masked completely the quality of the weaker component. Commercial odor counteraction methods appear to be a combination of true counteraction and masking. Whether a counteractant at any given moment masks rather than counteracts depends on the relative perceived magnitudes of the counteractant and malodorant smelled separately. Although differences in the ability of substances to counteract malodors may be moderate, there are probably large differences in masking ability. (Author summary modified)

55917 **APTIC NO. 73639**

Chansky, Steven, James Carroll, Benjamin Kincannon, James Sahagian, and Norman Surprenant

WASTE AUTOMOTIVE LUBRICATING OIL REUSE AS A FUEL. *GCA Technology Div., Bedford, Mass., Environmental Protection Agency Contract 68-01-1859, ROAP/Task 1B1030-51AQK-03, 1D1315-24ACN-04, Program Element 1BA030, Rept. EPA-600/5-74-032, 215p., Sept. 1974. 85 refs.*

GPO

The technical, economic, and environmental feasibility of using untreated and treated waste automotive lubricating oil as a blended fuel oil are evaluated. Lead is the primary contaminant of concern in waste automotive oil, though when waste oil is used as a fuel in systems with extensive heat transfer surfaces such as boilers, the quantity of lead particulates emitted with the flue gas during normal operation does not appear to exceed 50% of the lead entering the system. A higher percentage of lead emissions is possible for applications where heat transfer surfaces are not present such as in rotary kilns or incinerators. Calculations of maximum ground-level concentrations in the vicinity of a New England power plant firing 5 wt% oil and 95% number 6 residual oil (assumed waste oil lead content of 1%) result in values of slightly more than 0.10-0.15 micrograms/cu m; these maximum values are an order of magnitude smaller than the concentrations proposed as the ambient air standards for lead. An economic analysis of various waste oil and flue gas treatment alternatives reveals little difference in either capital or operating cost between alternative waste oil preparation methods. Electrostatic precipitation is the most economical flue gas treatment in terms of annual operating cost, though capital investment is the highest for this control method. Other alternative flue gas treatment methods include scrubbing and fabric filtration.

55918 **APTIC NO. 73230**

Cole, Edward N.

INTERNAL COMBUSTION ENGINE AND METHOD OF OPERATION FOR EXHAUST EMISSION CONTROL. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,823,555. 14p., July 16, 1974. 9 refs. (Appl. Dec. 6, 1972, 7 claims).*

A catalytic conversion device for the reduction of nitrogen oxides and the oxidation of hydrocarbons and carbon monoxide in automobile exhaust is described that combines several prior-art concepts to achieve quick catalyst heating and protection of the catalyst beds. A V-8 internal combustion engine with an inlet manifold disposed between banks of cylinders and a pair of exhaust manifolds disposed outboard of the cylinder banks has a converter unit containing reducing and oxidizing catalyst beds coupled to each exhaust manifold. During warm-up, exhaust gases from both banks of cylinders pass through a heat exchange region beneath the inlet manifold and then enter the converter units and pass through the catalyst beds. Air injection at the exhaust ports during the warm-up supports oxidation of the hydrocarbons and carbon monoxide, and the hot exhaust gases promote evaporation of fuel in the inlet manifold and heat the catalyst beds. After warm-up, a converter mode is entered in which exhaust gases are discharged from the exhaust manifolds directly into the converter units and pass through the catalyst beds. A reducing atmosphere provided in the first catalyst bed during the converter mode supports dissociation of nitrogen oxides, and air injected between the catalyst beds provides an oxidizing atmosphere for hydrocarbon and carbon monoxide conversion in the second catalyst bed. At high speeds or high temperatures, a reactor mode is entered in which air injected at the exhaust ports supports oxidation of hydrocarbons and carbon monoxide in the exhaust manifolds . The exhaust gases are then discharged from the exhaust manifolds directly to the exhaust pipes to protect the catalyst beds.

55919 **APTIC NO. 80409**

Crothers, W. T.

THE USE OF METHANOL IN TRANSPORTATION. *California Univ., Livermore, Lawrence Livermore Lab., Atomic Energy Commission Contract W-7405-Eng-48, Rept. UCID-16528, 34p., July 1, 1974. 43 refs.*

Methanol fuel utilization and its environmental impact are discussed. Fuel types and characteristics are discussed, including their history, blended fuels, and decomposed fuels. Methanol and gasoline are discussed in relation to engine design, including spark ignition engines and compression ignition engines. The discussion of emissions and controls includes federal and state standards and combustion and emission relationships. Research on blending, electronic control, and fogged fuel is discussed.

55920 **APTIC NO. 73622**

Davids, P. and H. Gliwa

MEASUREMENT AND ABATEMENT OF WOOD FIRING-GENERATED EMISSIONS. *(Die Ueberwachung und Verminderung der Emissionen aus Holzfeuerungen). Text in German. Schornsteinfegerhandwerk, vol. 1974:1-5, Oct. 1974. 4 refs.*

Problems of dust, soot, and tar emissions, and possibilities of emission abatement in combustion equipment designed for wood, especially of wood wastes not treated with any foreign materials, are described. The dust, soot, and tar emission, limited to 300 mg/cu m for mechanically fed equipment, and to 150 mg/cu m forr manually fed units, can be reproducibly measured by the use of a heated probe before the dust filter to avoid condensation. Afterburning by the admission of preheated secondary air or in a separate afterburning chamber is efficient in emission abatement. Dust, soot, and tar emissions can be reduced by means of cyclone type separators.

55921 **APTIC NO. 73454**

Deschamps, Andre, Claude Dezael, and Philippe Renault

PROCESS FOR PURIFYING A GAS CONTAINING OXYGEN AND SULFUR COMPOUNDS. *(Institute Francais du Petrole des Carburants et Lubrifiants, Rueil-Malmaison (France)) U. S. Pat. 3,833,710. 6p., Sept. 3, 1974. 4 refs. (Appl. June 7, 1972, 10 claims).*

A process for the absorptive removal of sulfur dioxide from stack gas and its conversion to elemental sulfur in a manner more selective than prior art processes of similar nature is described. The process involves contacting the gas with an aqueous solution of alkali metal or ammonium sulfite at between 0-90 C to convert at least a portion of the sulfite to the corresponding alkali metal or ammonium hydrogen sulfite. The SO2-depleted gas and an aqueous solution enriched with alkali metal or ammonium hydrogen sulfite are then removed, and the latter is contacted with a weak anion exchanger in order to regenerate the original aqueous sulfite solution and increase the SO2 content of the exchanger. The regenerated solution is separated from the exchanger and recycled to the zone of contact with the SO2-containing gas, with the contact being periodically interrupted. The portion of the exchanger not in contact with the SO2-laden gas is treated with an aqueous solution of ammonia to obtain a second aqueous solution of ammonium sulfite and to regenerate the exchanger. The second aqueous solution is separated from the exchanger which is again contacted with the first alkali metal or ammonium hydrogen sulfite solution. The ammonium sulfite of the second aqueous solution or the SO2 and NH3-containing gas resulting from its vaporization are then reacted with hydrogen sulfide to obtain elemental sulfur.

55922 **APTIC NO. 80657**

Elinsky, Stephen E. and Oscar Bud Lauren

ODOR MODIFICATION AND MASKING. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., 7p., 1974. 12 refs. (Presented at the State of the Art of Odor Con-*

trol Technology Proceedings, Special Conference, Pittsburgh, Pa., March 7-8, 1974.)

Odor modification is the process whereby, when two substances of given concentrations are mixed, the resultant odor of the mixture may be far less intense and objectionable than that of the separate components and may not even be perceptible. Masking is an attempt to superimpose a pleasant odor on top of an unpleasant odor, raising the total odor level. The human olfactory apparatus appears to be the finest odorant analyzer presently known. Application methods of odor modification are described. Odor modification is the most economical method of correcting malodor conditions. Two case histories involving successful use of odor modification are reported. (Author abstract modified)

55923 **APTIC NO. 80635**

Erokhin, A. V., V. D. Osipenko, and Y. S. Boiko

WET CLEANING OF STACK GASES OF THE OPEN HEARTH FURNACE. *Metallurgist (USSR) (English translation from Russian of: Metallurg. (Moscow)), 17(7 and 8):527-529, July-Aug. 1974.*

Operating experience with a wet venturi scrubber installed on a 500-ton open hearth furnace is described. After initial adjustments, a dust collecting efficiency of 97.5-98% was achieved. The outlet dust concentration was 90-100 mg/cu m at flow rates ranging from 2000-4000 cu m/hr and inlet dust concentrations ranging from 3-6 g/cu m. The hydraulic resistance at this efficiency was 730 mm of water. The optimum gas velocity in the venturi tubes was 120 m/sec. Inlet gas temperature variations within 300-500 C did not exert a substantial influence on the scrubbing efficiency.

55924 **APTIC NO. 73256**

Etienne

PERFORMANCES OF ELECTRIC VEHICLES WITH RECHARGEABLE BATTERIES. *(B-2-7- Performances des vehicules electriques a accumulateurs). Text in French. Preprint, Societe des Ingenieurs de l Automobile, Paris (France), p. 307-316, 1974. (Presented at the Congr. Int. FISITA, XV, Paris, France, May 13-17, 1974, Paper B-2-7.)*

The feasibility of electric vehicles with rechargeable batteries was studied. At the present state of the development in this area, it is possible to design electric vehicles adaptable to the particular traffic conditions. As the excess discharge of the battery during acceleration is largely compensated by charge recovery during braking, the electricity consumption in urban traffic is but slightly affected by the driving conditions. As there are as yet no batteries available that can satisfy all requirements regarding range and weight, the use of hybrid drives will be necessary on a temporary basis before new, more efficient systems (such as sodium-sulfur and zinc-air fuel cells) will be available for practical use.

55925 **APTIC NO. 79858**

Ficck, Kenneth J.

POTASSIUM PERMANGANATE FOR CLEANER AIR AND WATER. *Indian Chem. J. (Bombay), 8(7):33-39, Jan. 1974. 6 refs.*

The use of potassium permanganate to oxidatively destroy odorous ai pollutants generated by paint and surface coating operations is reviewed. The oxidant is particularly effective for the destruction of mercaptans and various other sulfur compounds, phenols, amines, and aldehydes. Normally a two-stage scrubber system is employed. The first stage uses a water wash or caustic soda wash to remove any oil, mist, smoke, or particulate matter tha possesses a high permanganate demand. The second stage for odor control usually consists of a countercurrent vertical tower that included packing to provide contact between the air stream and the recirculating scrubbing solution. Scrubbing solutions are normally maintained at a pH of 8.4. The scrubber construction materials range from mild steel to reinforced fiber glass or stainless steel. During the course of deodorization, the permanganate is reduced to manganese dioxide which is an insoluble precipitate, and proper maintenance of the scrubber involving the removal of manganese dioxide is important.

55926 **APTIC NO. 73511**

Gerhold, B. W. and A. M. Mellor

PRELIMINARY STUDY OF EXHAUST MANIFOLD REACTORS. *Combustion Sci. Technol., vol. 8:283-291, 1974. 11 refs.*

The kinetic operation of a thermal exhaust manifold was studied in a steady flow simulation experiment. Engine conditions were simulated by exactly duplicating the gas temperature and the mole fractions of hydrogen, oxygen, and carbon monoxide. Carbon monoxide, even in the presence of 10% water vapor failed to establish either luminous or nonluminous oxidation. The chemical reactions responsible for luminosity appeared to contribute negligibly to the performance of the reactor, and the appearance of luminosity was most likely due to a concentration of oxygen atoms that was significantly higher than found in the nonluminous case. Gas composition data indicated that reactor performance was not volume limited. The importance of hydrogen as an ignition source was confirmed, and the hydrogen-oxygen explosion limit appeared to explain the sharp transition to luminous oxidation.

55927 **APTIC NO. 73520**

Gorelik, R. A. and B. A. Chertkov

ABSORPTION OF SULFUR DIOXIDE FROM GAS OF LOW CONCENTRATION IN A SCRUBBER WITH PLANE-PARALLEL PACKING. *(Absorbtsiya SO2 iz nizkokontsentrirovannogo gaza v apparate s ploskoparallel noi nasadkoi). Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 6(10):640-643, Oct. 1974. 12 refs.*

An experimental scrubber with plane parallel packing was used to investigate the effectiveness of lime/limestone absorption for removing small concentrations of sulfur dioxide from stack gas. The scrubber measured 140 by 140 mm in cross section and consisted of six cylinders. The plates which were 2 mm thick and spaced 10 mm apart were turned by 90 deg (horizontal plane) in adjacent packets. Removal efficiencies of from 67.7-95.1% were obtained for gas inlet concentrations of 0.148-0.246% and gas velocities of 1.09-3.63 m/sec. The removal efficiency declined from 95% to 70% as the gas velocity increased from 0.5 to 4 m/sec for a constant liquor rate of 30 cu m/sq m/hr and a packing height of 2 m. Experimental values for collection efficiency were in good agreement with calculated values.

55928 **APTIC NO. 73386**

Groenendaal, W. and C. Ouwerkerk

RECENT EXPERIENCES WITH THE SHELL CLAUS OFF-GAS TREATING (SCOT) PROCESS. *Preprint, 14p., 1974. 6 refs. (Presented at the German Association of Mineral Oil Science and Coal Chemistry, Conference, 24th Hamburg, West Germany, Oct. 2, 1974.)*

A SCOT unit contains two sections: a reduction section and an amine absorption section. In the reduction section all sulfur compounds and any free S in the Claus off-gas are completely converted into hydrogen sulfide with hydrogen or a mixture of H2 and carbon monoxide over a cobalt/molybdenum-on-alumina catalyst at a temperature of about 300 C. As reducing gas H2 from an H2 plant or catalytic reformer make gas can, for instance, be applied. The effluent from the reduction section is cooled in two stages, first by generation of LP steam and then by direct contact cooling with water. This cooling system if flexible and displays a favorable response to upsets, such as temperature fluctuations and the presence of S. The water vapor present in the effluent is for the major part condensed in the cooling tower. The condensate contains only small amounts of H2S, which can be removed by conventional steam stripping. The steam-stripped condensate is of a good quality and can be used directly for cooling tower make-up. The cooled gas, which normally contains up to 3% vol H2S and up to 40% vol carbon dioxide, is countercurrently scrubbed with an alkanolamine solution in an absorption column. The absorber top gas, which now contains only some 300 ppm vol H2S, is incinerated in the Claus incinerator. The design of the absorption column is such that H2S is essentially completely removed, whereas only a fraction of the CO2 is co-absorbed. The fat amine solution is freed from absorbed acid gases in a conventional stripper. The top gas, consisting of H2S and CO2, is recycled to the feed of the Claus unit. Since 1973 two SCOT units have been in operation, and for one a substantial amount of operating and test data are available. Spot analyses indicate the carbon disulfide content to be below 1 ppm vol and the carbonyl sulfide below 75 ppm vol in the reduction reactor effluent. The sulfur dioxide is well under 500 ppm vol.

55929 **APTIC NO. 80373**

Haring, Robert C., Amos Turk, and Robert W. Okey

COST-EFFECTIVENESS RELATIONSHIPS IN ODOR CONTROL. *Ann. N. Y. Acad. Sci., vol. 237:328-338, 1974. 2 refs.*

Capital and operating costs are reviewed for various odor control techniques applicable to industrial operations. Odor abatement systems involving thermal or catalytic oxidation, adsorption, scrubbing, chemical oxidation, and masking are reviewed in terms of their cost effectiveness for industries involving chemical processing, pulp and paper manufacturing, petroleum refining, soap and detergent manufacturing, paint and glue manufacturing, metal casting, surface coating operations, textile production, sewage treatment, food processing, and agricultural operations. Mobile sources of odors are also covered. A series of abatement capital cost factors based on the basic equipment cost for the ancillary aspects of the capital cost is developed.

55930 **APTIC NO. 73536**

Harrison, W. B.

NEEDS FOR ENERGY AND ALTERNATIVE SOURCES. *Preprint, Triangle Universities Consortium on Air Pollution, 19p., 1974. (Presented at the Power Generation Air Quality Symposium, May 9-10, 1974.)*

The meeting of energy demands in the face of increasing fuel shortages and Federal regulations relating to emission standards for the electrical power industry are discussed in terms of possible alternative processes for power production and the sensitivity of environmental standards to conservation. Alternative fuel sources discussed include: coal gasification, solvent refining, nuclear power generation, geothermal energy, magnetohydrodynamic generation, fuel cells, and solar energy. Emission standards are cited as being insensitive to varying weather regimes, the location of a point source with respect to other sources, available technology, and the costs involved. The testing of present pollutant abatement strategies in the context of conservation ethics is recommended.

55931 **APTIC NO. 73601**

Harwood, J. J.

HIGH TEMPERATURE MATERIALS FOR AUTOMOTIVE POWER PLANTS. *American Physics Society, p. 115-129, 1974. (Presented at the American Physics Society Top Conference on Energy, Chicago, Ill., Feb. 4-7, 1974.)*

Opportunities for research in physics and solid state science arising from technical problems involved in automotive high temperature materials developments are described. Fundamental problems in catalysis are under study including: mechanisms of surface reactions, reactivity on alloy surfaces, stability of supported metal crystallites, and surface bonds of chemisorbed species. Control of engine performance with optimal emission levels and fuel economy requires sensors able to convert basic engine parameters into electrical signals which can be used as input and actuators which can translate these electrical inputs into action which control engine operation. Ignition timing, fuel metering, exhaust gas recirculation flow, and transmission shifting are some of the parameters being adapted to automatic feedback control techniques. Major problems associated with convertional gas turbines must be solved including: excessive oxides of nitrogen emissions, poor fuel economy at part power, and excessive initial engine cost and size.

55932 **APTIC NO. 73516**

Horzella, Theodore I. and Larry R. Newton

CONTROLLING AIR POLLUTION FROM HOGGED FUEL BOILERS. *Pulp Paper, 48(2):71-75, Feb. 1974. (Presented at the Air Pollution Control Association, Pacific Northwest International Section, Eugene, Oreg., Nov. 15-17, 1972.)*

Methods for the elimination of particulate emissions from hogged fuel boilers are reviewed with particular emphasis on combination systems employing multicyclone mechanical collectors followed by wet scrubbers. Cyclonic precleaners are capable of removing from 65-94% of the particulate emissions in dry form. Dust and carbonaceous material can then be reinjected into the boiler after passing through a sand-char separator. The elimination of part of the dust load to the scrubber automatically reduces the slurry water requirement. The use of scrubbers with relatively high slurry concentrations permits slurry disposal to be accomplished by mixing the slurry with sand-char particles from the collector. Overall collection efficiencies ranging between 97.6 and 99.6% for inlet dust loadings of 2.64-3.0 grains/standard cu ft are attainable with such combination systems.

55933 **APTIC NO. 73657**

Hurn, R. W. and T. W. Chamberlain

FUELS AND EMISSIONS -- UPDATE AND OUTLOOK, 1974. *Preprint, Society of Automotive Engineers, Warrendale, Pa., 13p., 1974. 10 refs. (Presented at the Society of Automotive Engineers National Combined Farm, Construction and Industrial Machinery and Powerplant Meetings, Milwaukee, Wis., Sept. 9-12, 1974, Paper 740694.)*

The effect of ambient temperature, engine modification, and fuel composition on exhaust emissions from internal combustion engines are reviewed along with the possible advantages of alternative fuels. The ambient temperature at which hydrocarbon and carbon monoxide emissions are minimal ranges between 65 and 80 F, depending on the vehicle. Nitrogen oxide emissions are relatively unaffected by ambient temperature. Catalytic converter emissions are very seriously affected by ambient temperature changes; sharp emission increases with reduced temperature occur within a very short interval during cold start. Engine modification for emissionss reduction, used alone, increases the photochemical reactivity of exhaust hydrocarbons; however, in conjunction with either thermal or catalytic conversion, reactivity is lowered substantially. Increased fuel aromaticity can raise exhaust reactivity except from systems employing thermal or catalytic exhaust conversion. Inadequate fuel volatility increases hydrocarbon and carbon monoxide emissions during cold start and warmup. Among alternative fuels, methanol offers the only viable option for the 1975-1980 time frame. Gasoline mixtures containing 3-5% methanol will probably not result in significant emission differences, though pure methanol offers excellent possibilities for reducing exhaust emissions. Carburetion or fuel injection equipment suitable for general use with straight methanol are not yet available, however.

55934 ***APTIC NO. 73212***

Idehara, Shigeyoshi

NOX CONTROL FOR PACKAGE BOILER. (Pakkeji boira no NOx teigen taisaku). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(12):1095-1106, Dec. 1974.

Package boilers at Kawasaki Heavy Industries Co. emitted 100 ppm to 300 ppm nitrogen oxides at a capacity of 40 tons/hr depending on the fuel used, kerosene being the lowest and C heavy oil being the highest. An NOx reduction method was developed by a joint venture between Kawasaki Heavy Industries and Toyo Rubber Co. The procedure used emulsion fuel several micron in size by mixing water and a small quantity of surfactant with petroleum fuel. Flame temperature was lowered due to the latent heat of water vaporization, and the NOx was reduced. The method was particularly effective for light fuel oils. The surfactant used for the procedure was a nonionic Resnox LN-100 which contains only C, H and O. Resnox LN-100 has the advantages of stabilizing the emulsion and of being non-polluting. Test results showed that at 1.0 to 7.0 tons/hr boiler capacity, NOx concentrations were reduced by more than 50% when kerosene or A heavy oil was used as fuel at a water/oil ratio of 2/8.

55935 **APTIC NO. 79877**

Jaeger, Walter

AIR PURIFICATION IN SULFURIC ACID PRODUCTION USING DOUBLE ABSORPTIO PROCESS. *(Luftreinhaltung bei der Schwefelsaeureerzeugung durch Doppelabsorptionsverfahren). Text in German. Chem.-Anlagen Verfahren, no. 7:40, 43-44, 1974. 4 refs.*

The double-contact method of sulfuric acid production offers a mean of reducing sulfur dioxide and sulfuric acid mist emissions, and of increasing the sulfur trioxide conversion rate. According to this method, the gas containing partially converted SO2 is cooled, and the SO3 is absorbed, after which the gas is reheated, admitted into the next contact stage, and absorption of SO3 is repeated. The overall efficiency of the double-contact method amounts to 99.8%. This method is applicable to sulfuric acid production from sulfur and from gases containing SO2 and/or hydrogen sulfide as generated in metallurgical processes, or in natural gas desulfurization.

55936 **APTIC NO. 80520**

Khristianovich, S. A., V. M. Maslennikov, Y.½. Vyskubenko, M. I. Derbaremdiker, M. K. Pis men, and P. M. Sharov

PROTECTING THE ATMOSPHERE FROM HARMFUL EMISSIONS OF THERMAL POWER STATIONS BY THE METHOD OF IN--CYCLE GASIFICATION OF HIGH-SULFUR OILS. *Thermal Eng. (English Translation from Russian of: Teploenergetika), 21(11):76-80, Nov. 1974. 7 refs.*

A method of in-cycle gasification of high-sulfur oils for the purification of stack gases from the chimneys of thermal power stations is described. The oil is converted almost totally into gas which consists mainly of hydrogen, carbon monoxide, and nitrogen. Soot is also formed in the gasification process. The sulfur compounds of the fuel are converted chiefly into hydrogen sulfide. The ash content of the fuel is in the form of suspended solids. A typical composition of the gas resulting from the gasification of high S oils with an S content of 3.7% is CO 2.8%, hydrogen 15%, nitrogen 56.5%, carbon dioxide 1.8%, water 3.4%, H2S 0.39%, and carbonyl sulfide 0.03%. The gas is cooled and the heat used for producing the working medium of the power plant. The gas is cleaned of soot and ash by being washed with water. The S compounds are extracted by absorption by amine solutions. The soot, which contains ash, is extracted from the soot-water suspension and is returned for gasification along with the initial oil. The part of the soot which contains the ash constituents is extracted for the recovery of valuable compounds of vanadium and other elements.

55937 **APTIC NO. 73201**

Kobayashi, Kazushi

IMPROVEMENT OF BOILER CONTROL SYSTEM FOR AIR POLLUTION PREVENTION. *(Haien kogai boshi taisaku ni tomonau boira seigyo sochi no kaizo). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 31(4):115-119, Dec. 1974. 1 ref.*

Modification of boiler control systemss in thermal power plants is described. In order to decrease amounts of sulfur oxides and nitrogen oxides in exhaust gases, fuel of lower pollutant content was burned. Two or more different kinds of oil (oil blending) were used for fuel or LNG was introduced into the heavy oil combustion boiler, so a mixture of oil and LNG was burned. By using the Shimadzu MS Control System, a combustion control system for oil blending and a steam temperature control system for use with heavy oil-LNG mixture were successfully put into operation.

55938 **APTIC NO. 73521**

Kosnyrev, G. T., N. A. Rakov, Y. Y. Vil nyanskii, and N. A. Krokhaleva

REDUCTION OF DILUTE NITROGEN OXIDES ON MATERIALS CONTAINING CARBON. *(Vosstanovlenie razbavl ennykh okislov azota na uglerodsoderzhashchikh materialakh). Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 6(11):696-697, 1974. 10 refs.*

Wood charcoal, metallurgical cokes from Nizhnii Tagil and Gubakha, and petroleum coke were examined in terms of their ability to reduce concentrations of nitrogen oxides found in stack gases. The rates of reduction of NOx were 24.40 ml/g/min for wood charcoal, 11.85 ml/g/min for Nizhnii Tagil coke, 5.24 ml/g/min for Gubakha coke, and 4.51 ml/g/min for petroleum coke at a space velocity of 2027 ml/min, a reduction z one temperature of 850 C, and an NOx concentration of 4.48 vol%. The extents of NOx reduction under these conditions were 95.9%, 92.7%, 88.4%, and 83.3% for wood charcoal, Nizhnii Tagil coke, Gubakha coke, and petroleum coke. Nizhnii Tagil metallurgical coke is the preferred reducing agent for full-scale NOx reduction in view of its good reducing power, its relatively low cost compared to charcoal, and its low sulfur content. This type of coke forms a strong ash which consists mainly of silicon and aluminum oxides.

55939 **APTIC NO. 73285**

Kudo, Hiroshi, and Yoshinori, Takada

ALUMINIUM SULFATE SUBSTITUTION GYPSUM PROCESS TO DESULFURIZE WASTE GAS. *(Ryusan aruminiumu chikan sekko-ho haien datsuryu). Text in Japanese. Kemikaru Enjinyaringu (Chem. Eng.), 19(12):1061-1064, Dec. 1974.*

The present process consists of an absorption process, oxidation process, and substitution process. Waste gas is at first sent to the bottom of an absorption tower which consists of a new vertical sieve tray (V.S.T.) of a high liquid-gas contact efficiency at low pressure loss, a spray zone for cooling and increasing moisture, and a demister for mist separation. While ascending the absorption tower, the waste gas contacts an absorbing solution above the new V.S.T. and sulfurous acid gas is removed. In the oxidation tower, fine air foam is generated to oxidize the solution to be sent from the absorbing solution by an atomizer. When absorption and oxidation are repeated, the basicity of the absorbing solution decreases. Part of the solution is therefore readjusted to increase the basicity and is sent back to the absorption tower so that the basic degree of the solution can be maintained at a constant value. Calcium carbonate is constantly fed into a substitution tank so that the basicity of the absorbing solution maintains a constant value. In the substitution process gypsum is produced as a byproduct in the form of slurry which is condensed by a thickener. The supernatant liquid is sent back to the absorbing tower, while the underflow is sent to a substitution tank so that gypsum slurry can circulate between the thickeners of the substitution tank, which is designed to promote the growth of gypsum crystals. Compared to a direct gypsum process, the present process causes less trouble due to slurry and it allows continuous operation. The new V.S.T. has a remarkable capacity to remove dust from waste gas.

55940 **APTIC NO. 80616**

Kuwada, J. T.

POLLUTION CONTROL FOR GEOTHERMAL POWER PLANTS. *AIChE Symp. Ser., 70(136):772-776, 1974. 6 refs.*

Emission control considerations for geothermal power plants are discussed. The principal air pollutants found in the noncondensible gas fractions are carbon dioxide, hydrogen sulfide, ammonia, methane, and hydrogen. Surface condensers can be used to largely confine the hydrogen sulfide problem to the vent stack where selective absorption using a solvent such as aqueous methyl diethanolamine can be employed. The problem of toxic compounds being released at the cooling tower if steam condensate is used as make-up water can be eliminated by installing a steam scrubber upstream of the turbine. The steam scrubber is expected not only to remove the mineral impurities but also ammonia and a portion of the hydrogen sulfide as well.

55941 **APTIC NO. 80902**

Lamb, Scott

FIELD BURNING. ALTERNATIVES SLOW TO EMERGE. *Oreg. Agri-Record, no. 263:3-6, Sept. 1974.*

Progress in developing economical alternatives to open field burning in the state of Oregon are reviewed. Open burning has been used by farmers to control disease and weeds and to use up some of the million tons of straw left after harvest. Mobile field burners are currently being developed to eliminate the smoke pollution problems experienced with open field burning. The requirements set for such field burners include meeting a Ringleman number 1 smoke emission objective, a 3-acre/hr travel rate, and an operating cost of less than $10.00/acre. Although no machine is presently capable of meeting these requirements, preliminary tests to date are promising. All of the new machines being developed are designed to operate with all or partial straw removal before the incinerator is put to use. A round baler is currently being developed for the harvesting of the entire crop of seed and straw. The seed is threshed in stationary threshers, and the straw is blown into piles to be redistributed on the field in specific amounts for use as fuel for a field burning machine. Other proposals include the building of a straw utilization center and the encouragement of private investment and usage of straw for saleable products.

55942 **APTIC NO. 73242**

Matsumura, Yuji

THE COUNTERMEASURE FOR NOX REDUCTION AND THE SAVING ENERGY. *(NOx eigen to sho-energi). Text in Japanese. Netsu Kanri To Kogai (Heat Management Public Nuisance), 26(11):10-21, Nov. 1974.*

A general discussion is given on nitrogen oxides reduction and energy saving techniques. Waste combustion gas from a boiler can be used as a substitute for hot air to dry plywood, saving 40% fuel and reducing 60% of total NOx. Unlike oil combustion, gas combustion does not require strong aeration so that NOx, carbon monoxide, and dust are greatly reduced. Data available showed 33% NOx reduction for medium-size CE boiler to 58% reduction for large combustion apparatus by using natural gas or urban gas. Flat flame firing in industrial furnaces increases the heating rate by about 30% as compared to side firing. High speed combustion by generating high temperature waste gas at 100-150 m/sec was also used as an energy saving technique in forging machines, metal melting furnaces, zinc plating furnaces, and wire heating furnaces.

55943 **APTIC NO. 79851**

McArthur, D. P.

NOX CATALYST DEGRADATION BY CONTAMINANT POISONING. *Preprint, General Motors Corp., Detroit, Mich., 24p., 1974. 14 refs. (Presented at the Catalytic Chemistry of Nitrogen Oxides, Symposium Detroit, Mich., Oct. 7-8, 1974.)*

Experimental findings dealing with nitrogen oxide catalyst poisonin are reviewed. The retention of contaminant poisons at catalyst operating temperatures below 1300-1400 F increases with increasing temperature because the ratio of lead oxide/lead halides in the exhaust gas increases with increasing temperature. For operating temperatures above 1300-1400 F, contaminant compounds which were formed at lower temperatures begin to decompose and volatilize, and contaminant retention decreases with increasing temperature. The ratio of lead/phosphorus determined for poisoned NOx catalysts is usually much smaller than the stoichiometric Pb/P ratio calculated for known lead phosphate compounds, indicating that much of the phosphorus retained on the catalyst is in the form of compounds resulting from the interaction of phosphorus with the catalyst support material. Catalyst phosphorus retention is much greater for phosphorus originating from engine oil than it is for phosphoru originating from gasoline. Catalyst degradation due to contaminant poisoning can be minimized by maintaining the catalyst operating temperature in the range of 1350-1600 F. (Author summary modified)

55944 **APTIC NO. 73570**

Mikhailin, A. D., A. I. Klenitskii, N. N. Postnikov, L. N. Sidel kovskii, R. Z. Khmel nitskii, V. V. Chichkov, Y. P. Kapralov, Y. B. Mel nikov, and V. A. Sartakov

COMBUSTION OF PHOSPHORUS IN A CYCLONE FURNACE. *Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 6(10):635-637, Oct. 1974. 6 refs.*

A method for the combustion of phosphorus in a cyclone furnace during phosphoric acid production is described which results in relatively low gaseous emissions. Phosphorus is fed into the furnace under 0.8-1.5 atmospheres of pressure through two spray nozzles heated by hot air. Most of the air for combustion enters the furnace tangentially at 60-80 m/sec through two nozzles. The air nozzles are mounted in the air channel at an angle to the draft stream such that the reagents become well mixed for the complete combustion of phosphorus within a short section of the cyclone furnace. The gaseous products contain no elemental phosphorus at an air excess of 1.2, and the content of phosphorus trioxide does not exceed 0.07%. Phosphorus pentoxide reacts with the furnace s chamotte lining material at high temperatures to form a corrosion-resistant gray-green aluminosilicophosphate glass.

55945 **APTIC NO. 73628**

Mishin, O. N., S. A. Tsygankov, and A. A. Shestopalova

LOWERING THE CONTENT OF SULFUR TRIOXIDE AND NITROGEN OXIDES IN FLUE GASES BY RECIRCULATING THEM. *(Snizheniye soderzhaniya sernogo angidrida i okislov azota v dymovykh gazakh putem ikh retsirkulyatsii). Text in Russian. Prom. Energ., no. 3:14-16, 1974. 6 refs.*

Pilot tests concerning the reduction of the sulfur trioxide and nitrogen oxides emissions in boiler flue gases are described. The recirculation of partially cooled flue gases into the combustion zone resulted in a considerable reduction of the oxides of nitrogen and sulfur trioxide concentrations in the flue gases. The pollutant concentrations decreased with increasing rate of recirculation. The reduction of the pollutant concentrations was due to the drop of the temperature in the combustion zone. The experimental results are confirmed by similar findings at a power plant boiler.

55946 **APTIC NO. 80063**

Morgunova, E. M., V. B. Vedernikov, O. P. Subbotina, A. N. Semenov, and M. N. Gafarov

LIBERATION OF FLUORINE-BEARING GASES IN SEMIHYDRATE PRODUCTION OF WET-PROCESS PHOSPHORIC ACID. ***(Vydelenie ftoristykh gazov v proizvodstve polugidratnoi ekstraktsionnoi H_3PO_4). Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 6(8):507-508, 1974. 5 refs.***

The liberation of fluorine-bearing gases during the semihydrate production of wet-process phosphoric acid was studied. About 32% of the fluorine from the apatite concentrate was found in the tail gas given off by the process. The fluorine:phosphorus pentoxie ratio of the gas phase was over 200, indicating that the tail gas can be used for synthesis of a suitable feed for the production of aluminum fluoride. It is necessary to install a system for removing phosphoric acid spray from the fluorine-bearing gas exiting from the concentrators, however, to obtain a fluosilicic acid suitable for aluminum fluoride production.

55947 **APTIC NO. 73300**

Morita, Yoshiro and Masami Takayasu

THE REMOVAL OF NOX BY CATALYTIC REDUCTION. *(Sesshoku kangen ni yoru NOx no jokyo ho). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 25(10):1149, 1974. 15 refs.*

The catalytic reduction of nitrogen oxides by hydrogen, carbon monoxide, hydrocarbons, hydrogen sulfide, and ammonia is summarized for dry methods of denitrification for NOx gas control. The denitrification process by hydrogen gas produces ammonia whose production can be controlled by the presence of oxygen. This method is not suitable to automobile exhaust gas control, but is promising as a stationary NOx source control. The reactions by CO reduction are the most promising methods for automobile exhaust gas control (dinitrogen oxide is produced besides nitrogen and carbon dioxide). These reactions proceed at low temperature, but development of catalysts which will not be poisoned by sulfur dioxide is necessary. Oxygen control is necessary in the NOx reducing process by hydrocarbons, since the oxidation of hydrocarbons is an exothermic reaction, thus increasing the reaction gas temperature, and high temperature destroys the activity of catalysts used in the process. The use of H_2S can remove both SO_2 and nitric oxide from flue gases, but it suffers from the drawback of H_2S pollution. All these reducing agents reduce NOx non-selectively, but ammonia as reducing agent can reduce NOx selectively. The reaction by ammonia is generally made at a reaction temperature between 250 to 350 C. The conversion efficiency from NO to nitrogen by this method decreases at temperatures above 350 C due to the increasing oxidation of NO to NO_2, but at temperatures below 200 C, ammonium nitrite is formed. Several plants using the NH_3 reduction process are already operating, and their denitrification efficiency is better than 90%.

55948 **APTIC NO. 73637**

Muermann, H.

DUST ABATEMENT IN THE INDUSTRY. *(Entstaubung in der Industrie). Text in German. Ind.-Anz., 96(45):1016-1021, May 1974.*

Design problems of air exhaust and dust separation in the woodworking and metallurgical industries are discussed. Exhaust hoods should be installed as close to the dust emission source as possible. Movable exhaust hoods can be used efficiently for many dust-generating operations, such as wood polishing. The air velocity for the exhaust system should be chosen between 16 and 22 m/sec for sand dust, between 20 and 24 m/sec for metal dust, and between 25 and 28 m/sec for metal shavings.

55949 **APTIC NO. 73193**

Nakajima, Yasuo

NITROGEN OXIDES EMISSION CONTROL APPARATUS BY INTRODUCING HEATED AIR. ***(Kanetsu kuki donyushike chisso sankabutsu haishutsu yokusei sochi). Text in Japanese. (Nissan Motor Co., Ltd., Yokohama (Japan)) Japan. Pat. Sho 49-47923. 5p., Dec. 18, 1974. 1 ref. (Appl. Sept. 11, 1969, 1 claim).***

An emission control apparatus for nitrogen oxides in the combustion chamber of a spark ignition engine is described. The device features a bypass duct from the air cleaner, part of which passes through the exhaust pipe for heat exchange, an electromagnetic valve through which the by-pass duct is connected to gas inlet under the carburetor, an electromagnetic coil which controls the valve with its terminals grounded on one end and connected to an electricity source on the other end through the thermal switch of a thermostat housing in the engine cooling water, a vacuum switch of a thermostat housing in the engine cooling water, a vacuum switch for detection of suction negative pressure, a speed relay for speed detection, and an ignition switch. Part of the inlet air is heated by exhaust gas and is introduced into the engine with unheated air at a suitable ratio. At high output operation of the engine, paths to the switches are opened through the electromagnetic valve so that cycle variation and misfire probability were confined to a desirable range.

55950 **APTIC NO. 73355**

Nakamoto, Mitsuyuki

NOX REMOVAL BY COMBINATION CATALYST OF COPPER, NICKEL AND CARBON. *(Do nikkeru, tansokei fukugo shokubai ni yoru NOx no jokyo). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(12):1057-1069, Dec. 1974. 12 refs.*

A general discussion is given on copper catalyst for nitrogen oxides removal including manufacturing methods and activity evaluation. Preparation of Cu catalyst by the segregation method is carried out by firing sodium chloride and aluminum silicate at 700 to 750 deg which generates hydrogen chloride and aluminum sodium silicate. The hydrogen chloride is reacted with copper oxide to give copper chloride and chlorine. The chlorine is reacted with copper silicate to give copper chloride also. The copper chloride is then reduced with charcoal to Cu at high yield. In the laboratory, a mixture of CuO, $CuCl_2$, nickel chloride, and graphite is fired in a quartz tube to give the metal whisker catalyst. A sample of the catalyst (Cu/Ni equals 80/20, metal/graphite equals 50/50) was tested for NOx removal from automotive exhaust. Exhaust gas containing 800-950 ppm NO from a 4-cycle gasoline engine using high octane gasoline was used for the test. Results showed that Cu-Ni-graphite with web as carrier had high catalytic reactivity and longer life than the conventional Monel catalyst.

55951 **APTIC NO. 73569**

Novikov, A. I., A. N. Skvortsov, and V. A. Kishkarev

CONICAL FLUIDIZED-BED SCRUBBERS FOR GAS PURIFICATION. *(Konicheskie skrubbery s psevdoozhizhennoi sharovoi nasadkoi dlya ochistki gazov). Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 6(11):705-707, 1974. 4 refs.*

An improved conical configuration for fluidized-bed scrubbers is described that reduces mist entrainment and improves the range of operating performance. The mobile packing is placed in a shell shaped as a truncated cone. The gas velocity at the lower base of the shell is high enough to fluidize the packing, while that at the upper base is low enough to minimize mist entrainment. The decrease in gas velocity from bottom to top causes the spheres to go into the fluidized state in a denser packing arrangement in the conical scrubber than they do in a device with constant area, thus leading to mist entrainment reduction, better liquor distribution in the packing, and improved contact between the working phases. Laboratory tests with gases containing silicon tetrafluoride and mineral dust (initial impurity concentrations of 0.6-1.0 g/cu m) indicated that maximum collection efficiencies of around 95% can be achieved at resistance values of 110-140 mm water for sprayed scrubbers and 90-120 mm water for ejection scrubbers.

55952 **APTIC NO. 73220**

Obana, Teruji

THE USE OF WASTE HEAT FROM DEODORIZATION COMBUSTION SYSTEM. *(Nensho dasshu sochi ni okeru hainetsu riyo). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 26(11): 22-29, Nov. 1974.*

A general discussion is given on combustion deodorization and utilization of waste heat. Odorous gases are usually combusted with the aid of a burner. At an industrial plant, odors at 220 N cu m/min were preheated at a no. 1 heat exchanger before being supplied to an oven where the odors were combusted at 750 degrees. The resulting gases were passed through the no. 1 heat exchanger where heat exchange occurred between the hot waste gas and the odors. The waste gas was introduced to the no. 2 heat exchanger where air was heated and supplied to the oven. The efficiency of deodorization was higher than 99% and the heat recovery was nearly 100%.

55953 **APTIC NO. 73383**

Oblaender, Kurt, Joerg Abthoff, and Axel Berndt Nagel

STATE OF THE ART OF CLEANING THE EXHAUSTS OF OTTO ENGINES. *(Stand der Abgasreinigung von Otto-Motoren). Text in German. Erdoel Kohle - Erdgas - Petrochem., 27(10):610-615, Oct. 1974. 6 refs.*

The measures for exhaust gas cleaning of internal combustion engines can be divided into two categories. The first category includes all measures aiming at optimization of engine parameters such as improvement of mixture preparation, modification of the engine design, and ignition timing. The second category includes additional devices for afterburning the exhausts emitted by the engine. Through ignition delay the hydrocarbon and oxides of nitrogen emission can be reduced at the expense of a higher fuel consumption. All measures for reduction of pollutant emission by modifying engine parameters lead to unsatisfactory fuel consumption and engine power properties if they aim at an optimum exhaust gas cleaning effect. In this respect catalytic, and (if not too rich a mixture is used) thermal afterburners are better. Both methods achieve a better cleaning of the exhaust gases although at higher expenditures. Curves developed by Babcock as well as by Caretto-Sawyer showing the degree of pollutant reduction as the arithmetic mean of the three pollutants carbon monoxide, hydrocarbon, and nitrogen oxides and referred to uncleaned automobiles show clearly that the cost benefit ratio is rather favorable up to a 50% cleaning of the exhausts. With increasing reduction of the pollutant emission the costs for the automobile rise steeply without major increases of the benefit.

55954 **APTIC NO. 73191**

Okumura, Eijiro, Hiroyasu Matsumoto, Yasuhiro Yumizu, and Toshio Tsugane

GAS-LIQUID APPARATUS FOR OXIDATION. *(Sankayo kieki sesshoku sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-48070. 4p., Dec. 19, 1974. 1 ref. (Appl. Dec. 18, 1970, 1 claim).*

A gas-liquid contacting apparatus for oxidation features a main oxidation cylinder, a liquid inlet tube on one side of the upper part of the cylinder, a rotary gas inlet tube on top of the cylinder, horizontally arranged plates which gradually decrease in size with spaces in between and all connected to the gas inlet tube serving as a bubble generator, a flow control valve at the bottom of the cylinder, and a gas-liquid separating tank connected to the bottom of the cylinder. Liquid such as potassium sulfite is supplied through the liquid inlet tube to the main oxidation cylinder where crystals are formed upon contacting the bubbles from the bubble generator. Gas separated from the liquid in the gas-liquid separating tank is introduced to a gas absorption tower for purification before release.

55955 **APTIC NO. 73627**

Pisarev, Y. K., V. M. Ivanov, and R. S. Zizyukina

POSSIBILITY OF ABATING THE OXIDES OF NITROGEN CONTENT IN THE COMBUSTION PRODUCTS OF FUELS. *(K voprosu o vozmozhnosti snizheniya soderzhaniya okislov azota v produktakh sgoraniya topliv). Text in Russian. Khim. Tverd. Topl., no. 2:154-157, 1974. 9 refs.*

The possibilities of abating the nitric oxide emissions from industrial firing used for the incineration of wastewaters contaminated with organic compounds in a coal-mazout suspension were studied. The combustion air was preheated to 700 K, and the air-excess coefficient was varied between 1.02 and 1.6. The NO emissions were decreased with the reduction of the air-excess coefficient to 1.03-1.05, and with the increase of the water dosage as a result of the reduction of the combustion temperature.

55956 **APTIC NO. 80792**

Porter, J. F.

MARINE INERT GAS SYSTEMS. *Petrol. Rev. vol., 1974:1-7, June 1974.*

Inert gas is used on oil tankers to fill the void spaces in the cargo tanks which carry liquids of relatively low volatility and thus prevent any possibility of an inflammable mixture being formed in the tanks and to purge the cargo tanks of inflammable vapor prior to the admission of air into the tanks for purposes of tank inspection or maintenance. The gas should not be corrosive or toxic, react with the cargo, or cause fouling or other maintenance problems. Inert gas can be obtained by the use of flue gas or independent inert gas generators. Flue gas from a ship s boilers contains some 2500 ppm by volume of sulfur dioxide with the heavy fuel oils with a high sulfur content that are normally used. This gas has a high solid burden. As a significant proportion of the material is of submicron and micron size, a high efficiency scrubber is required.

55957 **APTIC NO. 80418**

Quader, Ather A.

LEAN COMBUSTION AND THE MISFIRE LIMIT IN SPARK IGNITION ENGINES. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 19p., 1974. 21 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering Meeting, Toronto, Canada, Oct. 21-25, 1974, Paper 741055.)*

Single cylinder engine experiments with propane and isooctane as fuels were performed to investigate the causes of misfire in engines operating on very lean mixtures. Leaner operation was possible with improved mixture preparation, increased airflow, decreased nitrogen dilution, increased compression ratio, increased mixture temperature, decreased engine speed, more central spark location, and multiple spark plugs. The dominant factors responsible for these effects were mixture homogeneity, charge dilution, and charge temperature. Nitric oxide emissions at lean limits were very low and seemed to be nearly independent of the lean limit stoichiometry. Hydrocarbon emissions at the lean limit increased when the lean limit was extended. (Author abstract modified)

55958 **APTIC NO. 73503**

Ramsey, Ralph H.

LIVESTOCK AND THE ENVIRONMENT. A BIBLIOGRAPHY WITH ABSTRACTS. *East Central State College, Ada, Okla., Animal Wastes Tech. Information Center, Environmental Protection Agency Grant R801454-01, Program*

Element 1BB039, Rept. EPA-660/2-74-024, 362p., April 1974. 1346 refs.

GPO

An annotated bibliography of 1264 references on the management and disposal of animal wastes throughout the livestock industry is presented. Identification and location of pertinent information generated in the production operations of poultry, swine, cattle, fish, and other animals of economic interest raised in open or confined systems was accomplished through searches of technical journals, books, theses, reports from private, state, and federal agencies, papers given at meetings of professional societies or symposiums, and articles appearing in the trade or production oriented farm magazines. The search topics included: the physical and chemical characteristics of animal wastes; the operational and cost aspects of handling, collection, storage, transport, utilization, and disposal of animal manures; and the economic and legal impact of these wastes on the problems of air, water, and solid waste pollution. The following indexes are included: title, author, keyword, and animal information categories.

55959 **APTIC NO. 73257**

Rohs, Ulrich

AXIAL RECIPROCATING ENGINE WITH CONTINUOUS COMBUSTION. *(B-1-3- Axialkolbenmotor mit kontinuierlicher Verbrennung). Text in German. Preprint, Societe des Ingenieurs de l Automobile, Paris (France), p. 188-192, 1974. (Presented at the Congres International FISITA, XV, Paris, France, May 13-17, 1974, Paper B-1-3.)*

An axial reciprocating engine with continuous combustion is described and exhaust emission measurements are given. The axial reciprocating engine can be operated on diesel fuel, gasoline, or methanol. Test stand measurements on a 0.6-liter engine operated on regular gasoline revealed a nitric oxide concentration of 53 ppm, a total oxides of nitrogen concentration of 58 ppm, and 0.021 vol% carbon monoxide at an air-excess coefficient of 1.0. The emissions decreased with increasing air-excess coefficient up to 1.3; 4 ppm NO, 11 ppm total nitrogen oxides, and no CO and hydrocarbons were detected. Road tests on the same engine, operated with diesel fuel, showed 20 ppm NO and 26 ppm total nitrogen oxides. The exhaust gases of a 3-liter engine operated with regular gasoline on a test stand contained 23 ppm NO, 26 ppm total nitrogen oxides, 4 ppm hydrocarbons, and no CO.

55960 **APTIC NO. 73329**

Santanach, M. Isidro

ELECTRICALLY POWERED AUTOMOBILE WITH UNLIMITED RANGE. *(B-2-9- Automobile a traction electrique a autonomie illimitee.) Text in French. Preprint, Societe des Ingenieurs de l Automobile, Paris (France), p. 322-326, 1974. (Presented at the Congres International FISITA, XV, Paris, France, May 13-17, 1974, Paper B-2-9.)*

The experimental prototype of an electrically powered automobile with unlimited mileage, converted from a standard Renault Dauphine, is described. The car is equipped with high-capacity lead batteries, two dc motors, a single-cylinder 2.5 hp motor generator set, and no transmission. The air pollution generated by the small motor-generator set operating under steady-state conditions is negligible. Electric charge is recovered by means of an electric brake which assists the hydraulic brake on slopes. Depending on the rate of charge recovery, the range of the car amounts to about 150 km in urban traffic, and is practically unlimited during long-distance driving due to the use of the motor-generator set. The top speed, now between 60 and 80 km/hr, can be further increased. The weight of an especially designed car would not be greater than that of a standard compact car.

55961 **APTIC NO. 80636**

Segsworth, V. K.

INCO S SO2 EMISSION CONTROL PROGRAM. *Preprint, International Nickel Co. of Canada, Ltd., Copper Cliff (Ontario), Environmental Control Dept., 10p., 1974. (Presented at the Ontario Industrial Waste Conference, 21st, Toronto, Ontario, June 25, 1974.)*

Control measures to reduce sulfur dioxide pollution from the pyrometallurgical processing of iron, copper, and nickel sulfide concentrates are reviewed for two International Nickel Company smelting and recovery facilities. A fluid bed roaster/kiln process which produces a roaster gas containing about 8% SO2 is used for iron ore recovery. The gas is directed to sulfuric acid plants for subsequent recovery as 100% H2SO4. Oxygen flash smelting is used for copper processing, and off gas containing 80% SO2 is cooled and converted to liquid SO2. Nickel concentrate is roasted in a fluid bed roaster or in a Nichols- Herroschoff roaster, and the calcine is fed to reverberatory furnaces. Control by dispersion is accomplished with a 1250-foot high stack.

55962 **APTIC NO. 73600**

Shore, D., J. J. O Donnell, and F. K. Chan

EVALUATION OF R AND D INVESTMENT ALTERNATIVES FOR SOX AIR POLLUTION CONTROL PROCESSES. *Kellogg (M. W.) Co., Houston, Tex., Research and Engineering Development, Environmental Protection Agency Contract 68-02-1308, Task 7, Program Element 1AB013; ROAP 21ADE-029, Rept. EPA-650/2-74-098, 288p., Sept. 1974. 42 refs.*

NTIS: PB 238263/AS

An assessment of research and development alternatives for the control of sulfur oxides from utility plants, industrial boilers, non-ferrous smelters, sulfuric acid plants, and sulfur (Claus) plants is presented. For the largest 200 utility plants which are responsible for 75% of the sulfur dioxide emissions from utilities, stack gas scrubbing can achieve an overall plant emission of less than 1.2 lb SO2/MMBtu fuel fired from total capital investments ranging from $40/plant kilowatt to $75/kilowatt. Generation of substitute natural gas for supplying clean industrial boiler fuel low-sulfur coal is not the best way of utilizing such coal; it could probably be transported and burned directly in existing coal-fired industrial boilers at a lower overall cost. Solvent-refined coal has cost and efficiency advantages over SNG; however, it is a less flexible fuel and normally contains about 1% sulfur when produced from 4% sulfur coal. The Lurgi gasifier with a combined power cycle compares favorably in both efficiency and operating costs to the conventional steam cycle power station fitted with a Wellman/Allied stack gas scrubber, although the process is more complicated to operate than the conventional plant. Pressurized fluidized bed combustion has about the same efficiency as a conventional steam plant fitted with a stack gas scrubber; however, there are several unproven aspects of the process, including dolomite regeneration.

55963 **APTIC NO. 73330**

Stumpp, G.

REDUCTION OF POLLUTANT EMISSION AND OF THE FUEL CONSUMPTION DURING WARMING UP OF OTTO ENGINES. *(B-2-3-Verminderung der Schadstoffemission und des Kraftstoffverbrauches beim Warmlauf von Ottomotoren). Text in German. Preprint, Societe des Ingenieurs de l Automobile, Paris (France), p. 284-292, 1974. 4 refs. (Presented at the Congres International FISITA, XV, Paris, France, May 13-17, 1974, Paper B-2-3.)*

Possibilities to abate the carbon monoxide and hydrocarbon emissions, and to reduce the fuel consumption during cold start of spark-ignition engines are described in connection with the K-Jetronic system by Bosch. Mixture enrichment, causing only a slight increase in the fuel consumption, helps reduce the start-up time considerably and thus contributes to fuel economy. The rate of mixture enrichment can be reduced by heating the fuel with an electrically heated injection valve. The mixture enrichment considerably reduced the CO and hydrocarbon emissions during start-up, but the heated injection valve alone had little effect on the emissions.

55964 **APTIC NO. 73192**

Takeyama, T., K. Shoda, and R. Endo

TREATMENT METHOD OF EXHAUST GASES. *(Haiki gasu no shori hoho). Text in Japanese. (Tore Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-48398. 3p., Dec. 20, 1974. (Appl. June 29, 1972, 1 claim).*

An invention for the removal of harmful gases including carbon monoxide, hydrocarbons, and nitrogen oxides from internal combustion engine exhaust gas. Gas containing 3.1 vol% CO, 1000 ppm butene, 1400 ppm nitrogen dioxide, 3.9 vol% oxygen and 8 vol% water (nitrogen balance) was passed through a 12 mm inside diameter pyrex tube packed with 16.3 g of oxidation catalyst at the lower part and 9 g of carbon catalyst at the upper part, at a space velocity of 10,000 N cu m/hr. The oxidation catalyst was composed of 0.5 wt% platinum and 95.5 wt% aluminum and the carbon catalyst was composed of 70 wt% half-finished cokes and 30 wt% sodium hydroxide (10/20 mesh). Results showed 100% removals of CO and C_4H_8 and 91% removal of nitric oxide at 400 degrees.

55965 **APTIC NO. 73354**

Tanabe, Hiromi

SAFETY AND NOX CONTROL EFFICIENCY OF BUTANE GAS BOILER. *(Butan gasu boira no anzensei to NOx yokusei no jisseki). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(2): 1079-1089, Dec. 1974.*

Butane gas has a fire point of 405 deg with an explosion limit of 1.9-8.5 vol%. The maximum combustion rate of butane is 37.5 cm/sec while that of propane is 45.5 cm/s. A multi-port gas boiler using butane-air gas at 14,000 kcal/N cu m and having a maximum capacity of 20,000 kg/hr was given as an example of nitrogen oxides reduction effect. The boiler had a maximum pressure of 20 kg/sq cm and the saturated vapor was at 203.4 deg. At gas flow rate of 390-950 N cu m/hr and excess air ratio of 1.04-1.35, the NOx concentration in the waste gases ranged from 107 ppm to 223 ppm. Nitrogen oxides concentration increased with increasing excess air ratio and increasing load. Flame length increased with decreasing O2 concentration with the danger of explosion at extremely low O2 concentration. Nitrogen oxides concentration decreased with increasing number of burners.

55966 **APTIC NO. 80853**

Thomas, Noel G.

HOT BRIQUETTING OF WASTE OXIDES. *Dominion Foundries and Steel, Ltd., Hamilton (Ontario), Waste Oxide Recycling Steel Plants Proc., 1974. p. 8-1-8-13.*

Pilot plant operations involving the agglomeration of steel plant waste oxides by a hot briquetting technique are reviewed. The heart of the pilot plant was a fluid bed unit with a diameter of 5 ft. Material flow to the briquetting machine was from the fluid bed and also from a cyclone which removed solid particles from the waste gases. The air requirement of the process was 10,000 cu ft/ton of dust. The flue dust contained carbon, iron, silica, and calcium oxide. The pilot tests demonstrated that waste oxide material with a wide variation in chemical composition can be easily handled in the fluid bed without any operational problems. This wide range of waste oxide materials was also satisfactorily hot briquetted at a cost that was less than that for sintering.

55967 **APTIC NO. 80614**

Wilson, John S.

ENVIRONMENTAL ASPECTS OF THE MULTI-PURPOSE DEVELOPMENT OF GEOTHERMAL RESOURCES. *AIChE Symp. Ser., 70(136):782-787, 1974.*

The environmental impacts of a combined geothermal power and water plant were investigated by heating simulated geothermal water to 450 F and using two-step mode flashing. Carryover of boron, carbon dioxide, and hydrogen sulfide into the steam was observed. Oxidation of the hydrogen sulfide with oxygen prior to flashing was demonstrated as a feasible sulfide removal technique. The residual brine contained large amounts of hydrous silica solids. Corrosion from sulfides is expected to be a problem for all but the most exotic metals used at such plants.

55968 **APTIC NO. 73372**

Yokota, Norio, Shingo Tokuda, Yoshiro Ito, and Hiroshi Takaki

REMOVAL TECHNIQUE FOR MERCURY IN GASES. *(Gasuchu no suigin jokyo hoho). Text in Japanese. (Osaka Soda Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 49-43197. 3p., Nov. 19, 1974. (Appl. Dec. 29, 1970, 1 claim).*

The mercury vapor or mercury oxides in air, hydrogen, nitrogen, or hydrogen chloride gas can be removed efficiently by a metal iodide or compound expressed by general formula R4NI (where R is H or alkyl group with one to four carbons) and one or more than two types of inorganic reducing agents adsorbed on carrier such as activated carbon, zeolite or silica gel. The metal iodide is selected from a group consisting of lithium, sodium, potassium, calcium, magnesium, zinc, aluminum, iron, nickel, and cobalt iodides, and the reducing agent is selected from a group consisting of hydrazonium salt, hydroxylammonium salt, phosphorus acid and phosphite, thiosulfuric acid, hyposulfurous acid, sulfurous acid, and sulfite and stannous compounds. The reaction mechanism of mercury and iodide is not clearly known, however, it is presumed that mercury is captured by absorption or chemical reaction. Similarly, the function of reducing agent is not clear, however, it is presumably facilitating the removal of mercury by reducing mercury oxides.

55969 **APTIC NO. 73620**

Zabrodskii, S. S., I. A. Bokun, V. E. Bashlakov, Y. G. Epanov, and A. I. Leiko

COMBUSTION OF SULFUR MAZUTS IN A FLUIDIZED BED. *(Szhiganie sernistykh mazutov v kipyashchem sloe). Text in Russian. Vestsi Akad. Navuk Belarusk. SSR, Ser. Fix.-Energ. Navuk., no. 3:42-45, 1974. 7 refs.*

The combustion of high-sulfur mazout in fluidized beds was studied in laboratory experiments. Mazout with 2% sulfur, preheated to 70 C, was sprayed into a fluidized layer of dolomite particles with a particle size of 2.5 mm, which had been preheated to 250 C. Temperatures between 750 and 900 C were reached during combustion. The flue gases, examined for sulfur dioxide by means of indicator tubes and by the iodine method, contained no SO2, as a result of its rapid conversion into sulfates.

1973

55970 **APTIC NO. 80846**

Ayres, Robert V.

ALTERNATIVE MEANS OF CONTROLLING AIR POLLUTION FROM VEHICULAR ENGINES. *International Research and Technology Corp., Washington, D. C., INOVA 73, World Innovation Week, 1st Conf., Proc., Paris, France, 1973, p. 148-159. (June, Paper 10.)*

Possible strategies for minimizing the environmental effect of automotive exhaust emissions are discussed. A restraint may be either essentially regulatory or economic in nature. Only in rare cases, if ever, would criminal sanctions be imposed to enforce adherence to automotive emissions standards. A restraint may be applied directly on users or only with respect to the actual sources of pollution. Criteria for discriminating between those vehicles or uses that contribute most to pollution and least to pleasure or profit, and vice versa, are discussed. Only the dual catalyst pollution control system seems likely to be available for all types of automobiles before 1976, although the carbureted stratified charge engine appears to be far more cost effective. Unfortunately, it would probably require another year or two to adapt this system to larger engines. The feedback controlled electronic fuel injection system with three way catalyst convertor may become available in 1977 or 1978. Wankel engines plus thermal reactors may be satisfactory for small cars if a less severe nitrogen oxides standard is adopted in Europe. The same applies to diesel engines, for larger vehicles. The diesel is preferable in terms of fuel economy. Gas turbines, Rankine cycle and Stirling cycle engines are all possible competitors in the longer run. Gas turbines will be more attractive if manufacturing costs can be reduced by introducing ceramic components. (Author abstract modified)

55971 **APTIC NO. 80674**

Barnebey, H. L.

ACTIVATED CHARCOAL ADSORPTION IN COMBINATION WITH OTHER PURIFICATION METHODS. *American Society of Heating, Refrigerating, and Air Conditioning Engineers, New York, ASHRAE (Am. Soc. Heating, Refrig., Air Cond. Engrs.) Meet., Semiannu., Symp. Air Pollut. Control - Part II: Gaseous Emission Control, Chicago, Ill., 1973, p. 24-27. (Jan. 28-Feb. 1.)*

The use of activated charcoal adsorption either alone or in combination with other flue gas purification methods is reviewed. Activated charcoal is a logical component of a complete air purification system since in most cases it is an excellent final clean-up step and since in some cases it can serve as the complete purification method, giving effective air purification in one simple step. Many types of contaminants can be readily desorbed from charcoal so that the charcoal can be used again for purification and the desorbed contaminant can be recycled, used, sold, or incinerated. An excellent combination treatment method consists of scrubbing the gas with water and activated charcoal adsorption. The water removes particulate matter, some of the vapor if the concentration is high, and cools the gas. The charcoal removes any remaining vapors.

55972 **APTIC NO. 73500**

Bowen, Richard G.

ENVIRONMENTAL IMPACT OF GEOTHERMAL DEVELOPMENT. *In: Geothermal Energy. California, Stanford University Press, 1973, p. 197-215. 22 refs.*

The environmental impact of geothermal energy development is discussed and compared with other modes of electrical energy production. The natural steam generated from geothermal sources is predominantly water vapor. The noncondensable gas is about 80% carbon dioxide, with lesser amounts of methane, hydrogen, nitrogen, ammonia, and hydrogen sulfide. The last component is the most serious environmental problem. At The Geysers in California, H2S runs about 2-6% and averages 4.5% of the noncondensable gases from producing wells. In comparison with a 1000 MW coal-fired fossil plant using 1% sulfur and releasing 140 tons of sulfur dioxide/day, a geothermal plant with a flow of 430 million lb of steam/day containing 0.0225% H2S brings to the surface 48.4 tons of H2S/day; assuming that 30% is returned to the reservoir with the steam condensate, the total release is 33.9 tons or about one-fourth the SO2 from the coal plant. Carbon dioxide output from a 1000 MW geothermal plant is estimated at 860 tons/day as compared with 20,000 tons/day from a comparable fossil fuel plant. The radioactivity of the gases and steam from a geothermal plant is very near natural background and the total impact of such emissions on the air is many times less than that of nuclear plants.

55973 **APTIC NO. 80673**

Brandon, Cecil M., Walter Edwards, and Richard R. Palumbo

MOLECULAR SIEVES FOR THE CONTROL OF NOXIOUS EMISSIONS. *American Society of Heating, Regrigerating, and Air Conditioning Engineers, New York, ASHRAE (Am. Soc. Heating, Refrig. Air Cond. Engrs.) Meet., Semiannu., Symp. Air Pollut. Control - Part II: Gaseous Emission Control, Chicago, Ill., 1973, p. 15-20. 11 refs. (Jan. 28-Feb. 1.)*

The use of molecular sieves for the absorption of nitrogen oxides in flue gas is reviewed. Molecular sieves physically adsorb molecules as opposed to chemisorption where a chemical bond is formed between the absorbent and the adsorbate. This physical adsorption is characterized by a Langmuir-type isotherm which means that the amount of material adsorbed increases rapidly to a saturation or equilibrium value as its concentration or pressure increases in the carrier gas. The major requirement for molecular sieves in NOx service is that they be capable of withstanding acidic environments as severe as adsorbing NOx from wet gas streams, particularly during the regeneration step when they are loaded with NOx, nitric acid, and water and are heated to temperatures as high as 570 F for regeneration. Molecular sieve adsorption systems are designed for either mult- or single-bed operation, depending on whether the system is to be used continuously or on a batch basis. Molecular sieve NOx adsorption processes offer the advantage of almost total NOx removal from off gases to levels well below those possible with other commercially available processes. The NOx removed may be recovered for conversion to nitric acid or may be destroyed by reaction with one of several bases.

55974 **APTIC NO. 73539**

Cole, David E.

EMISSION CHARACTERISTICS OF THE WANKEL ROTARY ENGINE. *Preprint, Engineering Society of Detroit, Mich., and Society of Manufacturing Engineers, Dearborn, Mich., 18p., 1973. 10 refs. (Presented at the Rotary Engine Symposium, Detroit, Mich., Nov. 14-15, 1973, Paper MM73-654.)*

Emission characteristics of the Wankel rotary combustion engine are discussed and compared to those of piston engines. Pollutant formation processes in the two engines are nearly identical; but hydrocarbon emissions from the rotary engine are somewhat higher, whilee nitrogen oxide emissions are moderately lower than those from the piston engine. There is little difference in the level of carbon monoxide emissionss between the two engine types at an equivalent fuel-air ratio. The two principal techniques available for lowering emissions from the rotary engine are: optimization of internal engine processes and after engine treatment of the exhaust (thermal or catalytic reactors). Both thermal and catalytic reactors exhibit some advantages with the rotary engine over the piston engine because of the rotary engine s higher exhaust gas temperature and faster exhaust warm-up. By suitable engine design and adjustment of the operating variables it may be possible to control nitrogen oxide output from rotary engines without external control devices. Adequate control of hydrocarbons and carbon monoxide without external devices is doubtful, though one promising direction involves stratification of the fuel-air charge.

55975 **APTIC NO. 80400**

Darby, K. and K. R. Parker

SELECTION OF GAS CLEANING DEVICES. *Energy Dig., 2(6):35-38, Nov./Dec. 1973.*

There are four basic approaches for the removal of solid and liquid particulate materials from gases: cyclones, scrubbers, electrostatic precipitators, and bag filters. Important gas characteristics in choosing a control device include volume, temperature of gas leaving the process, moisture and acid content of the gases, composition of gases, and operating pressure of the gas. Dust concentration, in association with any statutory or presumptive emission limits, determines the overall efficiency of the device. Generally, the smaller the particle size the plant has to handle, the more complex the design needs to be. It is important to know whether the process is continuous or cyclic and the frequency and duration of shutdowns. If the process is cyclic, full information of the cycle of operation, including the variations in gas volume, temperature, dust concentration, and composition at various times in the cycle is needed. Typical operating temperature ranges for cyclones, fabric filters, scrubbers, and electrostatic precipitators are given. The method employed to reduce the initial temperature of the gas affects the final gas volume to be treated by the cleaning device very seriously.

55976 **APTIC NO. 73648**

Eckard, S. E. and R. D. Brooks

DESIGN OF RECIPROCATING SINGLE CYLINDER EXPANDERS FOR STEAM (FINAL REPORT). *General Electric Co., Cincinnati, Ohio, Nuclear Systems Programs, Office of Air and Water Programs Contract 68-01-0408, Rept. EPA-460/3-73-003, 235p., Oct. 1973. 59 refs.*

NTIS: PB-231 004

Practical single cylinder reciprocating expanders were designed for evaluating solid lubricants and other supporting materials for use in a Rankine cycle automotive propulsion system utilizing a water base fluid. Two single cylinder reciprocating expanders, a crosshead piston expander and a trunk piston expander, were designed and tested at pressures and temperatures up to 1000 psia and 1000 C, respectively. The best results were obtained with graphite rings rubbing against a hardened Type 400-C cylinder liner in the crosshead expander. For the first 200 hr of testing the total radial ring wear was approximately 0.040 in., giving a wear rate of 0.0002 in./hr. At 240 hr total wear was sufficient to cause ring breakage. Wear performance of the Cr3C2 coated Inconel X-750 rings in a Type 400-C cylinder was much less impressive. Ring wear was rapid which resulted in ring breakage in less than 10 hr of testing. Even with the graphite rings, ring/liner friction and steam blowby were higher than predicted. At 1000 psia, 1000 C steam inlet conditions theoretically indicated efficiency was calculated to be 85%, at 2000 RPM. Measurements for these conditions gave an engine efficiency of 55%.

55977 **APTIC NO. 80901**

Erny, Keith A.

POLLUTION CONTROL ASPECTS OF FERTILIZER PRODUCTION AND HANDLING. *Fert. Solutions, no. 5:79-80, Sept.-Oct. 1973.*

A closed system for the control of ammonia fumes generated at a fertilizer plant is described. During the manufacturing or loading of aqua ammonia, all fumes are drawn into a scrubber by an 8-inch fan. The fumes are then pushed through an 18-foot packing tower, with water and furnace-grade phosphoric acid being sprayed from the top of the tower. The ammonia fumes are thereby neutralized, and 100% control of ammonia fumes is accomplished when the system is properly operated. The system is capable of cleaning about 3250 cu ft of air/minute. The estimated cost of the system is about 30 cents/ton of aqua ammonia handled.

55978 **APTIC NO. 73630**

Garthe, H.

EXHAUST GAS IMPROVEMENT IN DIESEL ENGINES. *(Abgasverbesserung bei Dieselmotoren). Text in German. Ind.-Anz., 95(107):2531- 2536, 1973.*

Possibilities of reducing the pollutant emissions from diesel engines are described. The quality and toxicity of diesel engine exhaust gases is essentially determined by the oxides of nitrogen. A reduction of the mean pressure by 10% in diesel engines with direct fuel injection reduces the oxides of nitrogen emissions negligibly, while a similar reduction of the mean pressure in two-stage diesel engines operated on standard fuel results in a reduction by 50%, and also in a considerable reduction of the formaldehyde emission. The use of catalytic afterburners offers no improvement of the exhaust gas quality in terms of nitric oxide, and even increases the more toxic nitrogen dioxide emission. Exhaust components can be reduced most efficiently by the adoption of the two-stage engine design.

55979 **APTIC NO. 80874**

Giommi, G.

COMPREHENSIVE USE OF AIR POLLUTION CONTROL SYSTEMS. *(L impiego coordinato de metodi di controllo dell inquinamento atmosferico). Text in Italian. Ceramurgia, 3(1):53-56, 1973.*

Planning the control of air pollution caused by ceramic manufacturing installations requires a case by case approach with emphasis on economic, technical, and pollution aspects. The situation should be systematically divided into three phases: definition of the problem, planning of a process, principle, or method, and perfectioning of details. The establishment of a process necessitates consideration of the characteristic range of the discharge gases, the concentration of the pollutants, the temperature of the discharge gases, their humidity content, the production cycles, the corrosiveness of the discharge gases, and the fluctuations in the production process. A system to reduce pollutants will comprise collection of the gases (ventilators, ducts), cleaning apparatus (scrubbers, filters), and a dispersion system (chimney, ventilator, valve). On the basis of such procedures, it is possible to anticipate the amount of pollutants each installation can produce in a district and to prevent concentrations from surpassing limits established by law. The appropriate system for each installation can be chosen while abiding by air quality standards and with minimum investment and operating costs. It is also possible to establish a network of automatic analyzers which can constantly measure pollutant concentrations and which set off an alarm when concentrations increase abnormally in particularly adverse meteorological conditions.

55980 **APTIC NO. 73654**

Goss, John R. and George E. Miller, Jr.

STUDY OF ABATEMENT METHODS AND METEOROLOGICAL CONDITIONS FOR OPTIMUM DISPERSION OF PARTICULATES FROM FIELD BURNING OF RICE STRAW. SPRING OPEN FIELD BURNING TRIALS (FINAL REPORT). *California Univ., Davis, Dept of Agricultural Engineering, California Air Resourses Board Contract ARB-2113, Proj. ARB 1-101- 1, Rept. ARB-R-2113-73-11, 48p., June 30, 1973. 9 refs.*

NTIS: PB 235796

Field and laboratory studies demonstrated that fire management and rice straw residue management techniques can be used to minimize particulate emissions from spring open field burning. Moisture content of the rice residue was the primary field condition variable controlling particulate emissions. Head firing with a residue at 10% moisture content (wet basis) produced about 5 kg particulates/metric ton of fuel burned, while residue at 25% moisture content produced about 18 kg particulates/metric ton of fuel. Single line back-firing reduced particulate emissions by about 50% over single line head-firing. Decreased emissions occurred with increased fuel loading during laboratory burns, though improved drying characteristics of low fuel loading more than offset this possible benefit under field conditions. The minimum moisture content of the straw reached at any time during the day was strongly related to relative humidity as well as other climatic factors such as wind speed, air temperature, and solar radiation. Particulates were generally in the size range of 0.1-0.3 micron, and approximately 50% of the particulates were soluble in chloroform. Particulate samples from backfires showed a smaller percentage of soluble particulates than those from headfires. The estimated costs for various burning techniques were $.47/hectare for head fires, $1.61/hectare for backfires, and $.62/hectare for into-the-wind striplighting. (Author conclusions modified)

55981 **APTIC NO. 80407**

Lowe, Robert A.

ENERGY RECOVERY FROM WASTE: SOLID WASTE AS SUPPLEMENTARY FUEL IN POWER PLANT BOILERS (SECOND INTERIM REPORT). *City of St. Louis, Mo., Environmental Protection Agency Grant S-802255, Rept. SW-36d.ii, 24p., 1973.*

GPO 582-420/232

The light combustible fraction of domestic solid waste from St. Louis is burned as supplementary fuel with coal to generate electricity. The type of waste processed, capacity, redundancy, hammermill and particle size, air classifier, storage and transportation, ferrous metal recovery system, unloading and transfer at the power plant, and surge bin and firing system are described. The boilers modified to burn prepared solid waste have four coal firing, one solid waste firing, and five gas firing ports in each corner. The ash content, slagging, carryover, corrosion potential, and odors are discussed. The use of solid waste as a supplementary fuel will probably result in a reduction in sulfur dioxide and nitrogen oxides emissions. Particulate emissions will probably be essentially unchanged. New Source Performance Standards do not apply to retrofitting a utility boiler to burn solid waste as a supplemental fuel. The project recovers ferrous metals as well as fuel from municipal wastes. Fly ash is sold for cement manufacturing. Capital and operating costs for the project and trends in the cost of traditional waste disposal are discussed. The potential energy available from solid waste is significant. Financing alternatives are discussed.

55982 **APTIC NO. 80890**

McMillen, D. F., R. D. Weaver, and M. Anbar

POLLUTION-FREE ELECTROCHEMICAL POWER GENERATION FROM LOW GRADE COAL (INTERIM REPORT). *Stanford Research Inst., Menlo Park, Calif., National Science Foundation and Research Applied to National Needs Grant GI-34027, Proj. PYU-1916, Rept. NSF/RA/N-73-0108, 48p., Aug. 1973. 15 refs.*

NTIS: PB 228 006

The results of a study exploring the feasibility of a nonpolluting combined chemical-electrochemical system for generating electrical power are described. Coal is used to reduce lead oxide to a lead in a molten carbonate medium. This lead is used in a metal air electrochemical cell to generate electrical power. Reduction of lead oxide by solid petroleum coke in a molten sodium-lithium-potassium carbonate eutectic is a two step process whose overall rate is generally limited by the rate of reaction of solid carbon with carbon dioxide. The rate of this latter reaction is directly proportional to the external surface area of the coke. The rate of lead reduction is only slightly dependent on the stirring rate. The lead-air electrochemical system in molten carbonate is a feasible system for power generation. The feasibility of the concept will not be limited by the kinetics of PbO reduction. The system would be capable of producing electric power from coal with an overall efficiency of 42%. Since the melt retains hydrogen sulfide and sulfur oxides, the process could operate equally well on high sulfur coal char, at an even lower fuel cost/kilowatt hr. (Author abstract modified)

55983 **APTIC NO. 73584**

Miller, George E., Jr. and John R. Goss

STUDY OF ABATEMENT METHODS AND METEOROLOGICAL CONDITIONS FOR OPTIMUM DISPERSION OF PARTICULATES FROM FIELD BURNING OF RICE STRAW. RICE STRAW INCINERATOR EVALUATION (FINAL REPORT). *California Univ., Davis, Calif., California Air Resources Board Contract ARB 2112, Proj. ARB 1-102-1, Rept. ARB-R-2112-73-15, 38p., June 30, 1973. 20 refs.*

NTIS: PB 236405

Field tests were conducted with two mobile incinerators to determine their potential for reducing particulate emissions from the combustive disposal of rice field residues. Neither incinerator was capable of reducing particulate emissions during reasonably good climatic conditions to levels below those encountered during open field burning, and the incinerators were not operable under poor climatic conditions. Neither incinerator possessed sufficient field capacity to offset operating expenses and depreciation of the initial cost. An incinerator developed by Oregon State University that used a propane burner for primary ignition did, however, burn higher moisture content straw and stubble; it also reduced hydrocarbon and carbon monoxide emissions. A cyclone-type mobile incinerator that burned material on the ground and employed a return stack principle to reduce emissions showed the potential for reducing particulate emissions, though its development is not far enough along for final evaluations to be made. Overall, the state of the art of rice field residue disposal by mobile incineration is not sufficiently developed for the process to be economically feasible.

55984 **APTIC NO. 80868**

Nielsen, I.

LOW COST AIR-WATER POLLUTION CONTROL CHEMICALS FROM COLORADO OIL SHALE DEPOSITS. *AIChE Symp., Ser., 69(129):153-166, 1973. 15 refs.*

Colorado's reserves of nahcolite and dawsonite occur in rocks misnamed oil shale. The strata will yield low cost air and water pollution control reactants, petroleum, alumina, organic and inorganic chemicals, with little waste product. Nahcolite can be blown into the stack gas streams as a crude unrefined powder. The granules are caught on baghouse filters where they react with sulfur and nitrogen oxides. Nahcolite can remove more than 90% of sulfur dioxide at stoichiometric ratios of 1:1. Aluminate from dawsonite precipitates phosphates in sewage and provides clarification. The two minerals, nahcolite and dawsonite, occur in the 600 to 700 ft thick saline facies of Colorado's Green River formation. The deposit is the only one of its kind known in the world. Its 60 billion tons of nahcolite and 27 billion tons of dawsonite are destined to become the world's primary resource for these low cost air and water anti pollution reactants. A 25,000 ton/day plant producing 35% nahcolite, 10% sodium aluminate, and 20 gallons of oil/ton, at $10/ton, $40/ton, and $2.40/barrel, would yield $8.70/ton of throughput. This is compared to $1.80/ton of shale processed for its oil. (Author abstract modified)

55985 **APTIC NO. 73660**

Nishimura, Masato

THE APPLICATION OF POLYMERS TO WASTE WATER TREATMENT FOR POLLUTION CONTROL, PART 5. THE REMOVAL OF TOXIC AND DISAGREEABLE GASES BY ION EXCHANGE MATERIALS. *(Kobunshi o mochiiru haisui shorini yoru kogai boshi gijutsu, 5. ion kokantai ni yoru yugai oyobi akushu kitai no jokyo). Text in Japanese. Mizu Shori Gijutsu (Water Purif. Liq. Wastes Treat.), 14(6):69, 1973. 28 refs.*

The use off ion exchange resins to remove odorous gases and harmful gases including acidic gases such as mercaptans, sulfur dioxide, and nitrogen oxides, basic gases such as ammonia and trimethylamine, and neutral gases such as organic solvents is reviewed. Adsorption phenomena take place either chemically or physically. The amount of water content in resins is important for adsorption efficiency, and must be determined for each individual case. In the case of SO2 adsorption by m-aminophenol resin, the efficiency is poor if the resin contains less than 45% water; therefore SO2 absorption is made with a water content of more than 60% in the resin. On the other hand, the water contents in resins used for neutral gas adsorption are usually less than 10%. The regeneration of resins depends on the adsorption mechanisms. Alkyl metal resins can be used for mercaptans and ammonia gases; for example, t-butyl mercaptan can be adsorbed to R-silver, R2-copper or R2-cadmium resins in which coordination bonds are formed between metal and sulfur atoms. Since coordination compounds are formed, more gas per resin molecule can be adsorbed. Most of the resins are not heat stable and they are limitedd to use at temperatures below 110 C; therefore, flue gases must be cooled before contacting resins. To obtain higher adsorption efficiency, resins with high porosity are needed. One application of resins for purifying gases is the removal of hydrogen sulfide from natural gas. Deodorization of air at human waste and waste waterr treatment plants can be done by amphoteric resins.

55986 **APTIC NO. 73655**

Phillips, John F., Jr.

PROCESS CHEMISTRY, PROPERTIES, AND KINETICS. *In: Sulfur Oxide Removal from Power Plant Stack Gas. Lime-Limestone Wet Scrubbing Processes. Conceptual Design and Cost Study. Tennessee Valley Authority, Muscle Shoals, Ala., Office of Agricultural and Chemical Development, Environmental Protection Agency Contract, 229p., Sept. 13, 1973. 106 refs.*

The process chemistry, properties, and kinetics of limestone slurry scrubbing for the removal of sulfur dioxide from power plant stack gases are reviewed based on an examination of the literature pertaining to such processes. The most important parameters influencing limestone dissolution rate are slurry pH, stone particle size, and temperature, in decreasing order. The optimum pH appears to be in the range of 5.5-6.2. Limestone dissolution rates also increase with decreasing particle size, though the relationship is not direct. Increasing the temperature has a relatively minor effect on limestone dissolution. Benzoic acid appears to be the most promising organic acid to increase limestone solubility; the solubility of calcite increases with decreasing pH. Pilot tests indicate that limestone utilization as well as SO2 absorption efficiency increase with benzoic acid addition. The prevention of scaling lies in controlling supersaturation, with the latter being controlled by maintaining the slurry pH between 5.7 and 6.2. Although using the solid waste generated from the process construction and road material is under active consideration, the large quantity of such waste precludes utilizing a significant fraction of it; the most probable means of disposal for the near future is either via on-site ponds or off-site mines, quarries, and landfills. (Author summary modified)

55987 **APTIC NO. 73522**

Ramsdell, Roger G., Jr. and Charles F. Soutar

ANTI-POLLUTION PROGRAM OF CONSOLIDATED EDISON CO. OF NEW YORK. *Preprint, American Society of Mechanical Engineers, New York, Air Pollution Control Div., 39p., 1973. 4 refs. (Presented at the American Society of Mechanical Engineers, Air Pollution Control Division, National Symposium, Philadelphia, Pa., 1973.)*

The anti-pollution program of Consolidated Edison Company of New York is reviewed, with particular emphasis on the use of electrostatic precipitation for the control of fly ash from coal-burning electrical generating units. Collection efficiencies of 99% were achieved with low-sulfur coal that produced high-resistivity fly ash by increasing the temperature of the flue gas and locating an electrostatic precipitator between the economizer outlet of the boiler and air heater inlet. The precipitator was located ahead of a cyclone collector instead of at the usual location to insure the elimination of puffs due to rapping and malfunctioning of the precipitator.

55988 **APTIC NO. 73593**

Roth, James F. and James W. Gambell

CONTROL OF AUTOMOTIVE EMISSIONS BY PARTICULATE CATALYSTS. *Preprint, Society of Automotive Engineers, New York, 10p., 1973. 20 refs. (Presented at the Society of Automotive Engineers, International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973, Paper 730277.)*

Results from experiments involving the use of various types of particulate catalysts for the control of hydrocarbons, carbon monoxide, and nitrogen oxides from automotive emissions are presented, with particular emphasis on factors affecting catalyst performance and endurance. The catalysts examined contained base metal and/or noble metal active components dispersed on high surface area alumina supports. Low bulk density and thee presence of macroporosity improved conversion efficiency. Hydrocarbon oxidation activity appeared to be more sensitive to bulk density changes than CO oxidation activity. High dispersion of active components improved the resistance of base metal catalysts to chemically induced attrition, and pore size distribution improved the initial activity and resistance to deactivation poisons. Transformation of the support phase from a high surface area alumina to crystalline alpha alumina at high temperature caused a deterioration of mechanical properties and catalyst deactivation. Base metal oxidation catalysts deactivated severely in the presence of sulfur poisons, while promoted base metal catalysts were more resistant to sulfur poisoning. One type of NOx reduction catalyst; Monel, gave low ammonia formation when used at high temperatures, while another type, supported ruthenium, functioned suitably at much lower temperatures. Both showed durability problems, however. (Author summary modified)

55989 **APTIC NO. 80872**

Roux, A., A. A. Huang, Y. H. Ma, and I. Zwiebel

SULFUR DIOXIDE ADSORPTION ON MORDENITES. *AIChE Symp. Ser., 69(134):46-53, 1973. 16 refs.*

Adsorptive properties of the sulfur dioxide-mordenite system are presented. Pure component isotherms were measured by volumetric and gravimetric methods. Calorimetric measurements were made with a volumetric adsorption unit whose adsorption chamber is equipped for precise measurement of temperature changes. Binary adsorption isotherm measurements were made. The diffusivity measurements were made by gravimetric methods. The pure component isotherms can be correlated over a reasonably broad range with the Langmuir equation; sulfur dioxide is preferentially adsorbed over carbon dioxide even at over 90% carbon dioxide; the calorimetric heats diverge from the predicted isosteric heat at the low coverages; relatively low internal diffusivities were measured for the sulfur dioxide and a significant portion of sulfur dioxide cannot be desorbed at 100 C or below. A mechanism by which physical adsorption and chemisorption coexist (chemisorption occurring on some preferential site in the sieve structure) was suggested. The adsorption data of the sulfur dioxide and mordenite systems indicate favorable characteristics for exhaust gas scrubber systems. The sieves possess a high capacity for the sulfur dioxide, which is retained, although somewhat diminished, even at elevated temperatures. Interaction with nitrogen oxides is discussed. The interference of water may be more serious; sieves are well known to have a high capacity for water. However, the sulfur dioxide capacity will not be completely destroyed by its presence. If the relative concentration effects are detrimental, a small trimmer bed could be used to dry the gas stream prior to the main pollution control unit. (Author abstract modified)

55990 **APTIC NO. 73582**

Sanborn, John Worthen

A THEORETICAL STUDY DETERMINING THE EFFECT OF VARIOUS OPERATING CONDITIONS ON THE EMISSIONS FROM A TWO STAGE RANKINE CYCLE BURNER. *Massachusetts Univ., Dept. of*

Mechanical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-8628, 1973, 165p. 42 refs.

A theoretical evaluation of the effects of initial and final equivalence ratio, swirl intensity, and primary air mass flow rate on carbon monoxide, hydrocarbon, and nitrogen oxide emissions from a modeled two-stage, methane-air, Rankine cycle burner with heat transfer was performed. The first stage was operated at a fuel rich condition to reduce NOx, and air was added to the second stage to oxidize unburnt hydrocarbons and CO. The Rankine burner was modeled as five well stirred reactors in parallel for the first stage and five well stirred reactors in series for the second stage. The combustion process consisted of a 22 step kinetic reaction mechanism which included 15 species. The optimum operation condition was determined to occur at an initial equivalence ratio of 1.1, a final equivalence ratio of 0.4, and a swirl number of 1.35. Hydrocarbon, NOx, and CO levels at this operating condition were all less than the 1976 Federal emission standards. Compared to a highly developed automotive gas turbine, the Rankine burner produced more CO but much less hydrocarbons and NOx. (Author abstract modified)

55991 **APTIC NO. 73508**

Taheri, M. and S. A. Beg

BLAST FURNACE GAS CLEANING. *Metals Mater., 7(8):349-352, Aug. 1973. 11 refs.*

Experiments involving the use of a wetted septum valve as a scrubber for the removal of submicron particles and absorbing corrosive gases generated by blast furnaces are described. The principle of operation of the septum valve scrubber is the same as that of the venturi scrubber, viz., the wetting of dust particles with water followed by the separation of dust-laden drops from the gas. Experiments with a 3-inch diameter butterfly valve indicate that for pressure drops greater than 30 in. water collection efficiencies greater than 95% are attainable for submicron particles; efficiencies greater thn 99% are attainable for particles larger than 1.7 micron. Large industrial size butterfly valves used in the construction of septum valves appear capable of providing still higher collection efficiencies.

55992 **APTIC NO. 80678**

Waid, Donald E.

THERMAL INCINERATION: A SUPPLEMENT TO OUR SCARCE FUEL SUPPLY. *Preprint, Maxon Corp., Muncie, Ind., 9p., 1973. (Presented at the Purdue Air Quality Conference and Exhibition, Annual, 12th, Indianapolis, Ind., Nov. 7-8, 1973.)*

The use of thermal incineration for the destruction of organic air pollutants generated by industrial processes is discussed along with heat recovery techniques that reduce operating costs of the incinerator. Typical hydrocarbon, carbon monoxide, and nitrogen dioxide concentrations in the stack gas of an incinerator treating wire enameling oven effluents are 6 ppm, 272 ppm, and 4 ppm, respectively at a temperature of 1365 F. Hydrocarbon removal efficiency is 99.6%. The easiest and most efficient method of utilizing indirect heat exchangers when applying thermal incinerators to an existing process is preheating effluent from the oven before it passes over the burner into the combustion chamber. Direct heat recovery can often be accomplished by blending the exhaust air from the incinerator with make-up air for some nearby process.

55993 **APTIC NO. 80690**

Wallace, R. E.

THE WANKEL: PROBLEMS AND PROSPECTS. *Agr. Eng., 54(6):12-15, June 1973.*

The Wankel rotary engine is compared with conventional internal combustion engines in terms of performance, reliability, economy, and exhaust emission levels. Although hydrocarbon and carbon monoxide emissions from the Wankel engine are higher than those from conventional piston engines, current technology is available for controlling these exhaust components to Federal limits. The most popular method of achieving acceptable hydrocarbon and CO levels is catalytic oxidation. Nitrogen oxide emissions from the Wankel engine are inherently lower than those from piston engines due to the lower peak flame temperatures associated with the Wankel engine and can be kept within 1975 standards without the use of external exhaust gas recirculation systems.

55994 **APTIC NO. 80884**

White, Vernon S.

PLYWOOD PLANT REDUCES FUEL COSTS WHILE SOLVING WASTE DISPOSAL PROBLEM. *Forest Ind., 100(1):62-63, Jan. 1973.*

The simultaneous reduction of air pollution problems and fuel costs at a plywood plant is reported. The installation of a vortex burner to fire sander dust into the green-end zone of a veneer dryer not only avoided possible particulate emissions but also resulting in a gas bill savings of around $2300/yr. Present sander dust production at the plant is enough to heat the green zone of the dryer about 4 days a week. The speed of drying is unchanged whether gas or dust is burned. The burner is pre-lit by gas. Once the dust hits it, the air temperature rises to 800-900 F in 3-4 min.

55995 **APTIC NO. 73546**

Wixson, Bobby G. and M. Norman Anderson

MISSOURI LEAD BELT PROJECT. *National Science Foundation, Washington, D. C., (Energy, Environ., Prod. - Proc. 1st Symp. Res. Appl. Natl. Needs, Washington, D. C., 1973, p. 97-101. (Nov. 18-20.)*

GPO

The Missouri Lead Belt Project is discussed in terms of studies performedd in the vicinity of a lead smelter and subsequent control measures initiated by the plant. Excessive sulfur dioxide and acid mist emissions from the smelter were established as the causes of premature tree browning in the area, and a pattern of higher than background lead sulfur concentrations in soil and vegetation immediately around the smelter was documented. A high-efficiency mist eliminator was installed to eliminate the acid mist problem and reduce sulfur dioxide emissions. A continuous stack analyzing system is also being installed. Lead emissions were reduced by improved bag-house operation and maintenance, the replacement of an acid plant bag house with a hot electrostatic precipitator, and the installation of a new dust-handling and ventilation system to reduce fugitive emissions.

55996 **APTIC NO. 80904**

Young, Bruce

AN END TO WASTED ENERGY? *B. C. Lumberman, 57(4):39, April 1973.*

A system for converting wood waste to heat energy that can be used to operate a kiln is described. A turbulator is used to control the flow of waste particles into the combustion chamber of the system. The control of particle flow and oxygen supply permits combustion to occur at the most efficient level, thus reducing particulate emissions. The system's efficiency is between 75 and 80%. The stack gas from the combustion chamber contains only 4-7 grains of particles/1000 cu ft of air.

55997 **APTIC NO. 79963**

Research Inst. for Pollution and Resources (Japan), Tokyo Branch

COUNTERMEASURES AND PREVENTIVE TECHNOLOGY FOR SULFUR OXIDES. *(Io sankabutsu no taisaku to boshi gijutsu). Text in Japanese. Denryoku Sangyo To Kogai (Power Ind. Pollut.), no. 6:54-64, Sept. 1973. 14 refs.*

The reduction of emission of sulfur oxides by using low-sulfur fuel or by desulfurization techniques is surveyed. The sulfur content i fuels can vary from 0.5% in aviation gasoline to 3% in heavy oil used for boilers and internal combustion engines. In 1970, oil was the primary energy source in Japan (more than 70% of total consumption). Of oil imported into Japan, over 90% is high-sulfur Mideast oil. The amount of imported low-sulfur oil increases yearly, but comprised only 20% of the total in 1970. Further, the Unites States claims 40% of the total world production of low-sulfu oil. Thus desulfurization of heavy oil before combustion, or flue gases after combustion becomes necessary. Catalytic hydrogenation is the method now in use for heavy oil desulfurization. Desulfurization can be direct (desulfurization rate, 75%; catalyst life, 6 mo to 1 yr) 3-5 yrs; total desulfurization rate, 40-50%). Flue gas desulfurization processes include the dry (active carbon; formation of SO3; formation of sulfates) and the wet (alkali neutralization; slurry neutralization; weak acid salts; oxidation; reduction; absorption). Gasification desulfurization shows promise. Since 1966, MITI has aided development of large-scale desulfurization projects, but definite results are not apparent yet

1972

55998 **APTIC NO. 73370**

Ayusawa, T., T. Nemoto, K. An, and T. Tsuruga

SURVEY ON PERFORMANCE AND EXHAUST CHARACTERISTICS OF VARIOUS TYPE ENGINES. *(Kakushu enjin no seino to haiki no chosa). Text in Japanese. Nihon Jidosha Kenkyusho Hojo Jigyo Hokokusho (Japan Auto. Res. Inst., Inc., Rept.), vol. 1972:53-65 March 1972.*

Engine performance and exhaust characteristics were studied under laboratory conditions for three gasoline engines (Toyota-T (reciprocating engine); Mazda M-10A, Mazda M-12A (rotary engines)), and one diesel engine (Isuzu DA-640). Engine M-12A was equipped with a thermal reactor. Amounts of oxygen, carbon monoxide, and hydrocarbon emissions were higher for rotary engines than for the reciprocating engine. However, only half as much nitrogen oxides were emitted from the rotary engines. For Mazda M-12A (with thermal reactor), reduction of HC and O2 emissions was observed, and CO emission concentration curves followed theoretical emission concentration curves. Exhaust gas purification equipment operated mostly at times of cold starts and engine braking. Emissions from the diesel engine meet regulations in California (1973, 1975), 13-mode, and the United States, 21-mode.

55999 **APTIC NO. 80618**

Fegan, G. J.

CLEANING FERROALLOY FURNACE FUME WITH HIGH ENERGY SCRUBBERS. *American Inst. of Mechanical Engineers, Metallurgical Society, Electr. Furn. Conf. Proc. Chicago, Ill., 1972 p. 65-68. 3 refs. (Dec. 6-8.)*

The installation of a high energy scrubber at a ferroalloy plant to collect furnace fume is described along with some pilot and field test results. The scrubbing was performed by a two phase flow of steam and water mist. This flow also induced gas flow from the furnace by mass energy transfer so that no fans were required. The energy was mostly obtained from the furnace off gas heat. The outlet dust loading with a pilot unit (1/10 full size) ranged from 0.0066-0.097 grains/standard cu ft. Tests with a full-scale scrubber met all of the plant s requirements. The cost of a 30 megawatt ferrosilicon furnace scrubbing system is estimated to be about $1,100,000.

56000 **APTIC NO. 80381**

Gregoli, A. A. and G. R. Hartos

HYDRODESULFURIZATION OF RESIDUALS. *Advan. Chem. Ser., no. 127:98-104, 1973. 8 refs. (Presented at the American Chemical Society Division of Fuel Chemistry and Division of Petroleum Chemistry Symposium, New York, Aug. 29-30, 1972.)*

The hydrodesulfurization of residual oil is discussed in terms of feedstock characteristics, catalyst deactivation, the desirability of concurrent reactions such as hydrocracking, hydrogen consumption, and design considerations dealing with heat released from the process. Feed characteristics influence the selection of operating temperature, hydrogen partial pressure, space velocity, and catalyst type and usage. Extrudate catalysts require higher liquid velocities than fine catalysts to maintain the desired bed expansion. The liquid velocity is provided by recycling a portion of the effluent back to the inlet. The velocity required to expand fine catalysts is achieved by the flow of the liquid-gas feed mixture passing upward through the reactor. Organometallic compounds in the feed are the primary cause of catalyst deactivation. The deactivation rate is influenced by feedstock characteristics, catalyst characteristics, and operating severity. The costs of desulfurizing various representative types of crudes are given and show that Kuwait atmospheric residual is at least expensive to process while Venezuelan vacuum residual is the most expensive to treat.

56001 **APTIC NO. 73308**

Jo, Y., S. Kato, I. Kawashima, and T. Tsuchida

NOX REDUCTION IN DIESEL ENGINES - STUDIES ON NO FORMATION OF PRECOMBUSTION CHAMBER DIESEL ENGINES. *(Yonensho shitsu dizeru enjin no NO no seisei nitsuite). Text in Japanese. Nihon Jidosha Kenkyusho Hojo Jigyo Hokokusho (Japan Automobile Research Inst. Inc., Rept.), vol. 1972:43-52, March 1972. 4 refs.*

Variations in nitric oxide concentration in diesel engine precombustion chambers with changes in driving conditions were determined by conducting gas sampling on flow from the precombustion chamber to the main chamber. A single cylinder, water-cooled, 4-cycle, 780-cc precombustion chamber diesel engine was used in the experiments. The maximum NO value in the prechamber was less than NO values in the exhaust from a direct injection diesel engine. However, exhaust NO concentrations increase with quicker fuel injection timing, and with increases in the amount of fuel injection. Amounts of NO found in the exhaust are affected by NO formation in the prechamber. In another experiment, a combination of precombustion chamber fumigation and emulsion fuel injection was utilized to reduce NOx formation (by 40%), and at the same time decrease smoke concentration and somewhat increase power output. Problems such as production costs and complicated auxiliary fuel supply equipment stand in the way of making this system practical. However, more stringent exhaust gas regulations may force its actualization.

56002 **APTIC NO. 73375**

Kodera, Yoshihide

HEAVY OIL DESULFURIZATION PLANT. *(Juyu datsuryo puranto). Text Japanese. Preprint, Japan Society of Instrument and Control Engineers, p. 47-52, 1972. 11 refs. (Presented at the Japan Society of Instrument and Control Engineers, Lecture Meeting, Tolyo, Japan, May 23-24, 1972.*

Research on direct desufurization of heavy oil conducted at the Tokyo Inst. of Industrial Research is discussed. Approximately 14 cu m of hydrogen gas (N.T.P.) are needed for removing 1% of the sulfur in 1 kl of heavy oil. A flow bed method was carried out by using a 200 mm by 400 mm reactor at 360-400 deg and 100-200 kg/sq cm pressure. Heavy oil was mixed with hydrogen gas and the mixture was preheated. The mixture as well as recirculated oil were then supplied to the bottom of the reactor. Desulfurization occurred on the static catalyst while the mixture rose in the reactor. Oil and gas were separated by a high temperature separator and the desulfurized oil was measured after heat exchange with crude oil. The reaction gas was washed in a washing tower. Difficulty was encountered in maintaining a minimum temperature difference in the reactor.

56003 **APTIC NO. 73504**

Scheirman, W. L.

SELECTION OF TOTAL SULFUR RECOVERY SYSTEMS EMPLOYING THE STRETFORD PROCESS. *Preprint, Pritchard, J. F. and Co., Kansas City, Mo., 11p., 1972. 6 refs. (Presented at the Gas Conditioning Conference, 22nd Annual, Oklahoma City, Okla., March 17, 1972.)*

The Stretford process for total sulfur recovery from gas streams is described along with typical applications of the process. The method employs an aqueous solution of the sodium salts of anthraquinone disulphonic acid for the selective removal of hydrogen sulfide via precipitation as elemental sulfur. Outlet gas H2S content can be guaranteed as low as 0.2 ppmv in some cases, depending on plant design. The Stretford process can be used for purifying virtually any gas at any pressure, though liquid circulation rates can limit its size application on high pressure gas streams. Stretford plant operating temperatures are generally 80-100 F. Applications of the process include the removal of H2S from natural gas, the clean-up of refinery waste gas streams containing H2S along with mercaptans, the selective removal of H2S in streams containing carbon dioxide, the removal of H2S in combination with conventional liquid purification plants (e.g., amine plants), and the treatment of high pressure gas streams containing a relatively low percentage of H2S wherein the H2S must be disposed of after acid gas removal from the treated gas stream by an amine or other liquid type H2S removal process.

56004 **APTIC NO. 79865**

Sperkach, I. E., M. S. Shneiderman, and M. A. Yartsev

GAS-CLEANING INSTALLATION FOR THE OXYGEN-CONVERTER SHOP OF CHELYABINSK WORKS. *Steel USSR (English translation from Russian of Stal), no. 12:968-970, Dec. 1972.*

The operation of venturi scrubbers installed for the removal of dus emissions generated by three 100-ton oxygen converters at a steel-making plant is described. The gas-cleaning installation for each converter consists of a block of venturi tubes and two tangential sludge traps. The venturi tube block for two of the converters consists of 90 tubes with throats 90 mm in diameter. Th scrubber for the third converter consists of eight venturi tubes with an average throat diameter of 300 mm. The dust collecting efficiency of the venturi installations is 99.7%, and the average dust loading of the cleaned gas is 60 mg/cu m. Rapid oxygen blowin of the metal at a rate of 270-280 cu m/min makes available up to 75 tons of dust/day for reuse.

56005 **APTIC NO. 73309**

Yoshida, Yusaku

FUNDAMENTAL STUDIES ON FEASIBILITY AND PERFORMANCE TESTS OF VARIOUS POLLUTION-FREE ENGINES. *(Kakushu mukogai enjin no seino chosa to jitsuyoka no tame no kiso kenkyu). Text in Japanese. Nihon Jidosha Kenkyusho Hojo Jigyo Hokokusho (Japan Automobile Research Inst., Inc., Rept.), vol. 1972:120-125, March 1972.*

A gas turbine engine (IGT 60, manufactured by Ishikawajima Harima Heavy Industries) was used under laboratory conditions to study emission, performance, and effectiveness of exhaust gas recirculation (EGR), for continuous combustion engines. It was found that nitric oxide and nitrogen oxides emissions are low, but hydrocarbon emissions are quite high. The fuel consumption rate is not good. With 10% EGR, amounts of oxygen, HC, NO, and NOx decreased, while the amount of carbon dioxide increased. The concentration of CO was negligible. Power output did not change greatly. The decrease in exhaust concentrations may be primarily due to the effect of using smaller amounts of fuel.

1971

56006 **APTIC NO. 79886**

Aleta, C. R.

A CRITIQUE OF THE NEW EPA EMISSION STANDARDS FOR NEW STATIONARY SOURCES. *Cornell Univ., Ithaca, N. Y., National Science Foundation Grant GI-29903X, Rept. 71-11, 17p., Oct. 1971. 16 refs.*

NTIS: PB 228787

The ability of coal-burning power plants to meet the Environmental Protection Agency emission standards for new stationary sources wit present state-of-the-art control techniques is assessed. Particulate emissions are being adequately controlled using established control devices such as the electrostatic precipitator. The successful compliance with sulfur dioxide emission standards depends on the commercial breakthrough of processes under development. A 90% removal efficiency is sufficient to meet the standards when coals with up to 5% sulfur content and heating value of 10,000-15,000 Btu/lb are used. Technology for the removal of nitrogen oxides from stack gases is lagging far behind that for SO2 removal. Nitrogen oxide control may be possible by the proper design of conventional furnaces. However, other control techniques, such as stack gas removal, appear to be necessary for new combustion techniques like fluidized bed processing. (Author abstract modified)

1970

56007 **APTIC NO. 80629**

Cochran, Joe K., Jr. and Joseph L. Pentecost

CERAMIC MATERIALS FOR CATALYST SUPPORTS. *Preprint, Georgia Inst. of Tech., Atlanta, Ga., School of Ceramic Engineering, 10p., 1970 (?). 8 refs.*

Properties of low expansion ceramic materials considered as candidate automobile catalyst supports were investigated. Cordierite catalyst supports which are being produced in complex honeycomb configuration endured rapid cycling to a temperature of 900 C. Tests of three different commercial cordierite supports showed wide variations in expansion which appeared to be due to differences in phase content. Lowest expansions were found parallel to the extrusion direction for a given catalyst support. Materials with thermal expansions of less than 0.6-0.7 ppm/I C over temperature ranges of 0-800 C appear to be feasible with proper process control. Linear expansion coefficients are tabulated for cordierite, spodumene, aluminum titanate, beryl, and silica.

MEASUREMENT METHODS

1976

56008 **APTIC NO. 80530**

Fleming, J. W.

A LINE STRENGTH AND HALFWIDTH MEASUREMENTS FROM FAR INFRARED ABSORPTION SPECTRA: CARBON MONOXIDE. *J. Quant. Spectro. Radiative Transfer, 16(1):63-68, 1976. 10 refs.*

A method for deriving Lorentzian line shape parameters (line strengths and halfwidths) from absorption spectra taken at two different path lengths is discussed. Far infrared absorption spectra of carbon monoxide are analyzed to yield line strengths and halfwidths for the rotational transitions J double prime equals 3 through J double prime equals 9. Experimental errors are discussed, and the value for the dipole moment derived from the line strengths 0.108 + or - 0.005 D, is in agreement with the microwave value within experimental uncertainty. The Lorentzian halfwidths are compared, where appropriate, with two recent determinations of these quantities. Lorentzian halfwidths are also derived from absorption spectra taken at long path length using theoretical line strengths based upon mu subscript carbon monoxide equals 0.112 D. (Author abstract)

56009 **APTIC NO. 80778**

Levadie, Benjamin and Stephen M. MacAskill

ANALYSIS OF ORGANIC SOLVENTS TAKEN ON CHARCOAL TUBE SAMPLERS BY A SIMPLIFIED TECHNIQUE. *Anal. Chem., 48(1):76-78, Jan. 1976. 12 refs.*

A technique is described for the analysis of the carbon disulfide eluate from charcoal tube samplers used to determine individual personal exposure to organic solvent vapors. The carbon disulfide eluate was prepared by allowing 1 ml of carbon disulfide to remain in contact with each portion of the charcoal for 30 min. A mixture of phosphoric and sulfuric acids was used to strip the oxygenated peaks out of the solution. A mixture of dimethyl sulfate, sulfuric acid, and nitric acid was used to strip the aromatic peaks. A gas liquid chromatographic system, consisting of a gas chromatograph equipped with an isothermally heated oven and a flame ionization detector, was used to analyze the solution before and after stripping each set of peaks. The resolution of organic components of an air sample containing naphthas, aromatics, and ketones is important in workplace air testing. The relative toxicity of the naphtha components is much lower than that of the aromatics and some of the ketones. The aliphatic component creates a confusing element in the qualitative analysis by gas chromatography since as many as 20 peaks may be encountered, some of them with retention volumes identical to the aromatics and oxygenated compounds of interest.

1975

56010 **APTIC NO. 79917**

Axelrod, Herman D. and Steven G. Hansen

FILTER SAMPLING METHOD FOR ATMOSPHERIC SULFUR DIOXIDE AT BACKGROUND CONCENTRATIONS. *Anal. Chem., 47(14):2460-2462, Dec. 1975. 10 refs*

A filter sampling method for atmospheric sulfur dioxide at background concentrations is described. Whatman no. 17 filter paper impregnated with tetrachloromercurate (II) solution is used t sample for SO2 at levels as low as 0.05 ppbv at sampling flow rates as high as 6.5 l/min for as long as several hours. The analysis is accomplished by a modification of the West-Gaeke procedure. The precision of the method is 7% based upon the analysis of many samples taken in parallel. The use of mechanical equipment such as flow controllers affects the overall precision. At SO2 levels abov 1 ppbv, the results of the filter method are approximately 90% of the bubbler technique. For a 1000 l air sample at 600 torr, the sensitivity of the method is 0.05 ppbv. The method was applied to field studies and the data demonstrate there is no problem in obtaining background measurements of atmospheric SO2.

56011 **APTIC NO. 79843**

Barker, D. B., J. N. Brooks, A. Goldman, J. J. Kosters, D. G. Murcray, F. H. Murcray, J. Van Allen, and W. J. Williams

REMOTE SENSING OF TRACE CONSTITUENTS FROM ATMOSPHERIC INFRARED EMISSIONS AND ABSORPTION SPECTRA. *Preprint, Denver Univ., Colo., Dept. of Physics and Astronomy, 7p., 1975. 14 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Atmospheric infrared emission and absorption spectra obtained from aircraft and balloon-born spectrometers are presented. Mixing ratio versus altitude profiles are derived for nitric acid, difluorodichloromethane, trichlorofluoromethane, and hydrogen fluoride for altitudes up to 25 km. Freon 12 (CF2Cl2) shows two sharp spectral features at 921.9/cm and at 923.2/cm in addition to broad band absorption. The CF2Cl2 band occurs in a stratospheric window between minor absorption by HNO3 and carbon dioxide bands. Nitric acid column density is shown to increase from the equator to high latitudes, with the latitudinal variation in the northern hemisphere differing from that in the southern hemisphere. Calculated absorption spectra for hydrogen chloride, ammonia and sulfur dioxide are presented and demonstrate the feasibility of using remote sensing for the detection of these compounds also.

56012 **APTIC NO. 80966**

Barton, S. C., E. J. Chatfield, V. H. Neilson, and E. N. Turner

HOW TO CONTINUOUSLY MONITOR PARTICULATE EMISSIONS AUTOMATICALLY. AN AUTOMATED INSTRUMENT FOR CONTINUOUSLY MONITORING PARTICULATE EMISSIONS. *Pulp Paper Can., vol. 76:97-100, March 1975. 18 refs. (Presented at the Air and Stream Improvement Conference, Toronto, Canada, Sept. 23-25, 1974.)*

A prototype continuous particulate monitor was developed. Particulate material is sampled with a two-stage isokinetic probe, collected on a moveable membrane filter, and measured by beta radiation attenuation. Isokinetic sampling is automatically maintained and a dual detection system compensates for variations in gas composition and filter thickness. It performed well under simulated stack conditions. Repeated efforts to obtain satisfactory operation on the recovery furnace duct of a kraft pulp mill were frustrated by a series of practical difficulties. These could to a considerable extent, be attributed to the relatively extreme sampling conditions under which the tests were conducted. (Author abstract modified)

56013 **APTIC NO. 73606**

Beard, Michael, E., Jack C. Suggs, and John H. Margeson

AN EVALUATION OF THE EFFECTS OF NO, CO2 AND SAMPLING FLOW RATE ON THE ARSENITE PROCEDURE FOR MEASUREMENT OF NO2 IN AMBIENT AIR. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Methods Standardization and Performance Evaluation Branch, 34p., March 1975. 13 refs.*

ABSTRACT The arsenite method for the colorimetric determination of nitrogen dioxide in ambient air was investigated to quantify the effect of sampling flow rate and interference by nitric oxide and carbon dioxide on method response. The flow rate range over which the method response was unaffected was 220-270 cu cm/min which is considered adequate for ambient sampling. The sampling of atmospheres containing 50-250 micrograms/cu m of NO2, 50-310 micrograms/cu m of NO, and 200-500 ppm of CO2 revealed that the method response was linearly related to changes in NO2 level and that changes in the levels of NO or CO2 significantly changed the slope of the linear relationship. The method showed a positive bias of 9.9 micrograms/cu m over all concentrations tested, with the 95% confidence interval for this bias being 7.5-12.2 micrograms/cu m. The average bias introduced into the method due to NO and CO2 interference was small and did not necessitate a correction to the data obtained within the above concentration range. (Author abstract modified)

56014 **APTIC NO. 80814**

Beecroft, Tom, Arthur W. Miller, and Julian R. H. Ross

THE USE OF DIFFERENTIAL SCANNING CALORIMETRY IN CATALYST STUDIES. THE METHANATION OF CARBON MONOXIDE OVER NICKEL/ALUMINA CATALYSTS. *J. Catalysis, 40(2):281-285, Nov. 1975. 8 refs.*

The calcination, reduction, and catalytic activity for carbon monoxide methanation of coprecipitated nickel/alumina catalysts of the type used in hydrocarbon steam reforming was investigated. Differential thermal analysis and differential scanning calorimetry (DSC) are compared. The methanation reaction is particularly suitable for examination by DSC as it is exothermic. Typical DSC results for the decomposition in flowing nitrogen of samples of aluminum hydroxide, of basic nickel carbonate, and of a coprecipitate, prepared from solutions of aluminum nitrate and/or nickel nitrate by addition of sodium carbonate solution are given. Rates of supply or removal of heat and temperature are compared for a catalyst which was prereduced in a separate system and then reduced briefly in hydrogen at 773 K in the DSC apparatus. A catalyst calcined at 800 K was more active at all stages of reduction than one calcined at 900 K when compared experimentally. A decrease of methanation activity by hydrogen sulfide absorption and carbon deposition are also observed. The DSC technique may be used either for rapid and reproducible catalyst screening tests for more rigorous kinetic studies under strictly differential conditions, when it gives an accurate measure of reaction rates.

56015 **APTIC NO. 80566**

Biles, B. and M. McK. Ellison

THE EFFICIENCY OF CELLULOSE FIBRE FILTERS WITH RESPECT TO LEAD AND BLACK SMOKE IN URBAN AEROSOL. *Atmos. Environ., 9(11):1030-1032, 1975. 13 refs.*

Retention efficiencies were empirically determined of three types of cellulose filters which are used for sampling urban aerosols. Clean papers (Whatman 1, 4, and 541) retain approximately 50, 30, and 15% of lead and 70, 40, and 30% of black smoke respectively, at a face velocity of 6.5 cm/sec. Retention efficiency approaches 100% at a soiling value (100 - % Reflectance) of 40%. (Author abstract)

56016 **APTIC NO. 73268**

Brass, W., H. -J. Leckinhaus, and G. Resch

PROBLEMS AND EXPERIENCE WITH NOX DETERMINATION. *(Probleme und Erfahrungen bei der NOx-Bestimmung). Text in German. VGB Kraftwerkstechnik, 55(3):170-174, March 1975. 6 refs.*

Experiments with a portable chemiluminescence analyzer for the determination of oxides of nitrogen concentrations at the emission source and at greater distances are described. The gas sample to be analyzed is cooled and admitted into the analyzer through a heated PTFE pipe to avoid condensation. Nitric oxide is converted into nitrogen dioxide by means of ozone. The discharges by the NO2 molecules are detected and amplified by a photomultiplier. The readings are strictly linear between 0.01 and 1000 ppm. Oxides of nitrogen measurements at greater distances from stationary emission sources sometimes must be carried out at suboptimal sensitivity because temporary sources nearby, such as passing vehicles and even lit cigarettes, can cause concentration peaks.

56017 **APTIC NO. 80845**

Camp, David C.

X-RAY FLUORESCENCE TECHNIQUES FOR MULTI-ELEMENT POLLUTANT ANALYSIS. *Preprint, Lawrence Livermore Lab., Livermore, Calif., 41p., 1975. (Presented at the Recent Advances in the Analytical Chemistry of Pollutants, Symposium, 5th, May 19-21, 1975.)*

Several types of X-ray spectrometry and their use in determining trace elements in aerosol particulate samples are discussed. Inorganic aerosols are emphasized. Results of a recent intercomparison study are also presented. X-ray spectrometry has been revitalized by the energy dispersive techniques. Energy dispersive X-ray fluorescence will probably find increasingly wider acceptance.

56018 **APTIC NO. 80839**

Campbell, Evan E., Gerry O. Wood, and Robert G. Anderson

DEVELOPMENT OF AIR-SAMPLING TECHNIQUES (PROGRESS REPORT). *California Univ., Los Alamos, N. Mex., Industrial Hygiene Group, National Inst. for Occupational Safety and Health Contract NIOSH-IA-74-10, Proj. R-059, Rept. UC-41, 19p., July 1975. 11 refs.*

NTIS: LA-5973-PR

Air containing N,N dimethylaniline and water vapor was pumped through sampling tubes containing two silica gel sections. The fraction retained on the first was a function of the amount after the breakthrough point. The retention amounts, obtained by extrapolation, of N,N-dimethylaniline and other anilines fit a linear relationship when plotted against logarithm vapor pressure at 25 C. The tube would be more effective for N substituted or ring substituted anilines. Precision of temperature programmed gas chromatographic analysis can be improved by reducing residence times for o-anisidine and p-nitroaniline. It should be used for sample identification and isothermal analysis for quantitative results. Removal of adsorbed aliphatic amines was studied with different acids, acid concentrations, and reaction times. Gas chromatography was useful for qualitative and quantitative analysis of eight aliphatic amines. Sampling methylamine and ethylamine vapors was studied in humid air. The silica gel in the two smaller sections of the sampling tube retained an 8-hour sample of either. A study of sampling, desorption, and analysis of methylamine resulted in + or - 1.2% relative precision and 99.2% accuracy for 1.2 mg samples. Formaldehyde sampling studies demonstrated that water vapor reduces the collection efficiency of alumina. Two 2 cu cm sections of alumina in an 8 mm glass tube are recommended for short term or 8-hour sampling. Significant loses of adsorbed formaldehyde mean that collected samples must be treated immediately. One percent methanol prevents polymerization of formaldehyde monomer for at least 2 wk and would preserve the sample until analysis. (Author abstract modified)

56019 **APTIC NO. 80540**

Corte, G. L., G. Dowd, and L. Dubois

CALIBRATION OF MERCURY VAPOR MONITORS BY PERMEATION. *Am. Ind. Hyg. Assoc. J., 36(12):873-878, Dec. 1975. 1 ref.*

A permeation system is described which provides constant concentrations of mercury in air. The permeation tube, containing a quantity of pure mercury, is mounted in a gas train. The tube is bathed in a stream of pure dry carrier gas. The gas mixture, now containing mercury, is then conducted into one or more of the instruments to be calibrated. The concentration of mercury in the permeation stream is simultaneously recorded by a reference ultraviolet photometer. Mercury vapor concentrations can be selected at will. (Author abstract modified)

56020 **APTIC NO. 79911**

Cuddeback, John E., Willian R. Burg, and Shelton R. Birch

PERFORMANCE OF CHARCOAL TUBES IN DETERMINATION OF VINYL CHLORIDE. *Environ. Sci. Technol., 9(13):1168-1171, Dec. 1975. 12 refs.*

The adsorption characteristics of airborne vinyl chloride on activated charcoal was examined for use as an analytical sampling device. Charcoal has a limited yet useful capacity for levels of vinyl chloride. Breakthrough volumes, sampling rates, and storage characteristics indicate a 100 mg portion of activated charcoal in sampling tube has a capacity of at least 65 microgram of vinyl chloride with a twofold safety factor when sampling air containing ppm of vinyl chloride. Analytical methodology is described that produces a 90% recovery of vinyl chloride even after 2 weeks of sample storage. (Author abstract modified)

56021 **APTIC NO. 80771**

Dharmarajan, V., Ronnie L. Thomas, Ray F. Maddalone, and Philip W. West

SULFURIC ACID AEROSOL. *Sci. Total Environ., 4(3):279-298, Sept. 1975. 43 refs.*

A brief discussion of the significance of sulfuric acid aerosol is presented together with a review of methods for its sampling, separation, and determination. All of the present methods depend on some form of collection, either by inertial impactions on a filter or by impingement or scrubbing in a suitable medium. A method is described for generation of standard sulfuric acid aerosol samples, which are needed for testing new methods for determining sulfuric acid. Separation of sulfuric acid aerosol is discussed. Determination of sulfuric acid by thermal reduction of perimidylammonium sulfate is described. Two field methods for the determination of sulfuric acid aerosol are also described, one based on the use of the ring oven technique and the other based on a spectrophotometric finish.

56022 **APTIC NO. 80518**

Dobreva, M.

CHEMICAL MICROMETHOD FOR QUANTITATIVE DETERMINATION OF FREE CRYSTALLINE SILICA IN FINELY-DISPERSED INDUSTRIAL DUSTS. *Ann. Occupational Hyg., 18(2):121-127, Sept. 1975. 13 refs.*

A chemical micromethod for quantitative determination of free crystalline silica in the presence of silicates is described. It is based on Polezhaev s method of digestion of silica using a mixture of potassium chloride and potassium HCO3. The method requires 2-3 mg of dust and is suitable for the analysis of respirable dusts. Its main advantage over present chemical and physical methods is that it may be applied in the presence of a wider range of silicate materials. There was a mean relative error of + or - 4%, and good reproducibility and accuracy using a great number of dust samples of various mineral and chemical compositions. The method is recommended as a standard. (Author abstract modified)

56023 **APTIC NO. 80773**

Dowd, G., R. S. Thomas, and J. L. Monkman

SENSOR RETENTION TIMES OF AIR POLLUTION MONITORING EQUIPMENT. *Sci. Total Environ., 4(3):271-278, Sept. 1975. 8 refs.*

Retention times associated with photometric sensors used in air pollution monitoring equipment are analyzed. Values of 0.1 to 0.2 microsecond, or 0.06 to 0.18 microsecond are reported for load resistors of 1 megohm and anode currents of 1.0 to 5.0 microamperes, depending on whether the step response is integrating or differentiating. Cabling capacity or bypass or bypass condensers increase the retention times to 30 times the sensor level. Three types of signal process integration are analyzed, two using field effect input operational amplifiers. The effect of residual voltages on large electrolytic condensers is measured in relation to loading. A circuit component layout for optimizing upper frequency response and minimizing retention time is given. (Author abstract)

56024 **APTIC NO. 80896**

Dowd, G. and J. L. Monkman

TWO METHODS OF REMOVING PROBLEMS ASSOCIATED WITH DATA TRANSMISSION FROM AIR POLLUTION MONITORS. *Preprint, American Chemical Society, Washington, D. C., 27p., 1975. 4 refs. (Presented at the American Chemical Society Meeting, 170th, Chicago, Ill. Aug. 24-30, 1975, Paper CD-669.)*

Two methods are discussed as applied to the transmission of output signals from mercury, phosphorus, ozone, and oxides of nitrogen monitors. One system used the digital mode of signal processing whereas the other was essentially an analog device. There are two distinct methods of removing problems associated with data transmission through them. The first method enlisted signal processing before transmission and was ideally suited to a digital system. It produced, however, an artificial objectivity that depended upon a perfectly running detector. The second method used signal processing after transmission and could only be handled by an analog system. It assumed no objectivity at the acquisition center by projecting the operator to the monitoring site. High frequency analysis of these outputs is shown, and the two transmission assemblies used are outlined. Data obtained before and after transmission and evidence of malfunctions passed through the analog system are presented. (Author abstract modified)

56025 **APTIC NO. 80774**

Dowd, G. F., L. Dubois, and J. L. Monkman

INTEGRATION AND ENHANCEMENT OF LOW-LEVEL SIGNALS FROM AIR- POLLUTION MONITORING SENSORS. *Sci. Total Environ., 4(3): 263-270, Sept. 1975. 9 refs.*

An inexpensive air pollution monitor, beset with low frequency noise, may give good results with evoked response signal averaging. The type of signal to noise gain that may be expected from an inexpensive mercury monitor is shown. As long as an evoked response time constant is introduced into the measuring system, noise of a random nature may be reduced to such an extent that trace signals, buried deep in the electrical background, can be reliably measured. Coupling this type of analysis to a multiparameter mercury analyzer permits the contributing factors to be evaluated. (Author abstract modified)

56026 **APTIC NO. 81021**

Duggal, V. K. and J. S. Howarth

A PRELIMINARY STUDY OF THE STRUCTURE OF DIESEL SMOKE. *J. Inst. Fuel, 48(394):38-44, March 1975. 8 refs.*

A coulter counter method for particle size distribution of diesel smoke was investigated. It allows a particle size distribution against number density analysis between 0.6 micron and 16 micron. Diesel smoke contains particles in the micron and submicron range. The numbers of particles are in the region of 10 to the 6th power/cu ft of exhaust gas after the aggregates of particles have been eliminated by filtration. Individual small particles are spherical in shape. The bigger particles in diesel smoke are the aggregates of small particles. The particles are loosely bound together. The conventional smoke meters are not adequate for measuring total soot emitted in diesel exhaust. The coulter counter is an adequate method for particle size distribution in the region 0.6-30 micron produced in diesel smoke. (Author conclusions modified)

56027 **APTIC NO. 80937**

Eguchi, Tadashi

MEASURING METHOD FOR NITROGEN OXIDES AND APPLIED EXAMPLES. *(Chisso sankabutsu no sokuteiho to oyorei). Text in Japanese. PPM (Japan), 6(11):29-41, 1975. 8 refs.*

Analytic methods for nitrogen oxides generated from stationary sources, such as boilers and furnaces, and mobile sources such as automobiles are described. Nitrogen oxides cause photochemical smog that irritates eyes and throats, is destructive to rubber tires, and is harmful to vegetation and human respiratory organs. Air sampling methods and source sampling methods for nitrogen oxides are discussed. Chemical analytic methods, including the phenolic disulfonic acid method (P.D.S.) and the naphthyl ethylene diamine method (NEDA), automatic analysis by Saltzman method and by chemiluminescence method, automatic analysis by infrared absorption method and ultraviolet absorption method, and analysis by static-potential electrolytic method are discussed.

56028 **APTIC NO. 73614**

Ellis, E. Carol and John H. Margeson

AN EVALUATION OF THE GAS PHASE TITRATION TECHNIQUE AS USED FOR THE CALIBRATION OF NITROGEN DIOXIDE CHEMILUMINESCENT ANALYZERS. *Environmental Protection Agency, Research Triangle Park, N. C., Methods Standardization and Performance Evaluation Branch, Program Element 1HA327, 49p., March 1975. 25 refs.*

The gas phase titration technique for calibrating chemiluminescent continuous nitrogen dioxide analyzers is evaluated. The calibration technique involves gas phase titration of nitric oxide with ozone that produces NO2 stoichiometrically. Significant errors can be introduced into the analyzer calibration if the standard NO cylinder is incorrectly assayed for NO as well as trace NO2 or if the converter efficiency of the analyzer is always assumed to be equal to 1.0. Provisions are included in a detailed method write-up of the procedure to eliminate such errors. Normal variations in such factors as reaction and mixing chamber volumes, ratio of dilution air flow to flow through the ozone generator, use of different ozone generators with different dilution air flows, and the use of different standard NO levels appear to exert little effect on the gas phase titration procedure. (Author abstract modified)

56029 **APTIC NO. 73553**

Ellison, Alfred H.

MEASUREMENT AND MONITORING OF ENERGY-RELATED AIR POLLUTANTS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 23p., 1975. 41 refs.*

Techniques forthe measurement and monitoring of energy-related air pollutants are outlined. Particulate matter measurements include: high volume sampling, in-stack filter measurements, measurements based on beta radiation attenuation, inertial sizing, X-ray fluorescence analysis, and visibility readings. Sulfur dioxide measurement methods include: titration with barium perchlorate, optical techniques such as diode laser systems, X-ray fluorescence (for sulfates from automotive exhaust), colorimetry (pararosaniline method), and flame photometric detection. Nitrogen oxide measurements are performed with such methods as colorimetry (phenol disulfonic acid procedure), chemiluminescence, and gas chromatography-electron capture detection (for nitrates like peroxyacyl nitrates). Techniques for measuring organics vary from flame ionization detection for the measurement of total hydrocarbons to chromatographic separation and flame ionization detection for the measurement of various individual hydrocarbons. Liquid chromatography is important in the analysis of specific carcinogens such as benzo(3-4)pyrene. Chemiluminescent reactions are used for photochemical oxidant (ozone) measurements. Methodology being evaluated for measurements of hydrogen chloride includes polarographic techniques and infrared spectrophotometry. Trace metal analysis is performed with techniques like emission spectroscopy, various wet chemical procedures, and X-ray fluorescence.

56030 **APTIC NO. 80811**

Fujitani, Yoshiyasu, Kazuo Ota, and Ryo Tomita

EFFECTS OF COEXISTING GASES ON SO2 ANALYZER. *(SO2 kei no okeru kyoson gasu no eikyo ni tsuite). Text in Japanese. Preprint, Japan Society of Air Pollution, Tokyo, p. 301, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Japan, Nov. 5-7, 1975.)*

The effect of coexisting gases such as ammonia, hydrochloric acid, chlorine, nitric oxide and nitrogen dioxide on airborne sulfur dioxide analysis using the conductivity method is investigated. An SO2 analyzer, model GR-3C of the Denki Kagaku Keiki, Co., Ltd., was used in the test to plot the relation of the concentration of the coexisting gases versus indicated volume on the SO2 analyzer. The relation of each coexisting gas concentration to the SO2 volume was rectilinear in the plot, except for NO2 which is not affected up to a concentration of 0.45 ppm. The maximum allowable coexisting concentration of NH3, HCl, Cl2, and NOx was 0.01 ppm, 0.16 ppm, 0.01 ppm and 0.06 ppm respectively. The effect of NH3 is especially great because its maximum allowable coexisting concentration, 0.01 ppm, is similar to the concentration of NH3 normally contained in the atmosphere. Therefore, coexisting NH3 must be watched carefully during SO2 analysis.

56031 **APTIC NO. 80838**

Griggs, M.

A STUDY ON THE DETERMINATION OF THE ATMOSPHERIC AEROSOL CONTENT USING ERTS DATA (FINAL REPORT). *Science Applications, Inc., La Jolla, Calif., National Oceanic and Atmospheric Administration Contract 4-35365, Rept. SAI-75-566-LJ, 16p., April 17, 1975. 2 refs.*

Further data points were sought for relating radiance and aerosol content by finding coincidences between Earth Resources Technology Satellite (ERTS) data and aerosol data obtained routinely by the National Oceanic and Atmospheric Administration-Environmental Protection Agency turbidity network, with emphasis on high aerosol contents, and conditions of possible sun glitter. Seven turbidity network sites, plus the National Aeronautics and Space Administration Houston area network, were identified as being near to bodies of water, and hence suitable for relating ERTS data and turbidity data. Twenty four coincidences of ERTS and turbidity data were found; of these, four were high aerosol contents. Examination of the ERTS black and white prints of these 4 days revealed that two of them will aid in checking the relationship between radiance and aerosol content where data points are presently sparse. The lower turbidity values are useful for providing statistical support of the existing data. (Author abstract modified)

56032 **APTIC NO. 73448**

Hayano, Shigeo

DETERMINATION OF ATMOSPHERIC NITROGEN OXIDES. *(Taiki chu no chisso sankabutsu no sokutei). Text in Japanese. Seisan-Kenkyu (Prod. Res.), 27(3):102, March 1975. 4 refs.*

The role of nitrogen oxides in photochemical smog is that nitrogen dioxide undergoes a photochemical reaction producing atomic state oxygen which forms ozone, and nitric oxide is oxidized to form nitrogen dioxide. The latter reaction occurs quickly under the presence of peroxyacetyl nitrate. The PAN is produced by the reaction between NO2 and peroxy acid radical which is produced by the reaction between hydrocarbons and ozone. The atmospheric NOx level is generally between 0.01 to 0.1 ppm and seldom exceeds 1 ppm, therefore the Nox analysis is a trace analysis requiring a method with high sensitivity. The analytical methods of NOx determination used are the Saltzman method and chemiluminescence method. Polarography is a potential technique for NOx determination. The NOx may be converted to NO2, which is absorbed by dimethylformamide or dimethyl sulfoxide and the pH of the NO2 absorbed solution is adjusted to be acidic. By using a platinum electrode and lithium peroxide as the supporting electrolyte, the pulse polarography of the NO2 absorbed solution is expected to show two waves: -1.7 volt and +0.2 volt versus SCE. The former is attributable to the nitrite ion reduction wave, and the latter to the NO2 reduction wave. The sensitivity of this method is 1 to 10 ppm, however it can be improved by using a better absorbing solution for NO2.

56033 **APTIC NO. 80555**

Henriques, A. and J. Isberg

A NEW METHOD FOR COLLECTION AND SEPARATION OF METALLIC MERCURY AND ORGANOMERCURY COMPOUNDS IN AIR. *Chem. Scr., 8(4):173-176, 1975. 2 refs.*

A method for collection and direct separation of the vapor of metallic mercury, monomethyl, and dimethyl mercury was developed. Silver, copper, platinum, palladium, cadmium, zinc, tin, lead, and bismuth show certain characteristic differences in their ability to take up vapor of metallic mercury and the organomercury compounds. Mercury and mercury compounds in the form of vapor were conducted over the metals. The collectors were coupled to a flameless atomic absorption instrument. The other metals were compared experimentally to gold for each mercury compound. Vapors of organomercury compounds show a strong affinity to gold and varying affinities to palladium and platinum; metallic mercury vapor is taken up 100% by gold, silver, copper, palladium, and platinum. Metallic mercury may be separated from the organomercury compounds by combining suitable collectors. Combinations of silver and gold and copper and gold functioned best in collecting and separating metallic mercury, monomethyl and dimethyl mercury. Only the silver and gold combination functioned without complication in field studies: in damp air copper collectors become blocked by corrosion of the metal. Examples of the composition of the air from an island in the Baltic and from laboratories and a writing room at the Royal Institute of Technology are given. (Author abstract modified)

56034 **APTIC NO. 79845**

Hoell, James M., Jr., William R. Wade, and R. T. Thompson, Jr.

REMOTE SENSING OF ATMOSPHERIC SO2 USING THE DIFFERENTIAL ABSORPTION LIDAR TECHNIQUE. *Preprint, NASA Langley Research Center, Hampton, Va. and Old Dominion Univ., Norfolk, Va. 9p., 1975. 15 refs. (Presented at Environmental Sensing and Assessment, Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

The application of an ultraviolet differential absorption lidar system to the remote measurement of sulfur dioxide emissions from a steam generating plant is reviewed. The remote sensing system utilizes a commercial flashlamp-pumped frequency doubled dye laser, a 0.25-meter (diameter) receiver telescope, and a minicomputer for controlled data acquisition and processing. The output of the lase is typically 100 microjoules/pulse at 15 pulses/sec for wavelengths coincident with the peaks and valleys in the SO2 absorption spectru from 296.0-300.1 nm. Average concentrations of SO2 in the region surrounding the exhaust stack of a steam plant are determined out t ranges of 0.8-1.9 km with sensitivities varying from approximately 10 ppb at 0.8 km to 20 ppb at 1.9 km. The maximum observed concentration is 150 ppb over 1.2 km. Variations in the measured SO2 concentrations correlate well with variations in wind direction and scheduled variations in SO2 production by the steam generating plant. (Author summary modified)

56035 **APTIC NO. 73435**

Hosoya, Tatsuo

MEASUREMENT METHOD FOR PHENOLS IN EMISSION GASES AND ACTUAL MEASUREMENTS AT THE REMOVAL SYSTEMS. *(Haigasucho no fenoru-rui sokutei hoho to jokyo sochi no jissoku kekka). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(7):42, July 1975.*

An analytical method for phenol determination by 4-aminoantipyridine solution is described. Phenol reacts with 4-aminoantipyridine in thee presence of potassium ferricynide to form a red oxydiazo compound whose maximum absorption is at 510 millimicron. The stable reaction product was formed within 20 min when 2 ml of 4-aminoantipyridine (0.1 g/100 ml water) and 2 ml of potassium ferricyanide (0.2 g/100 ml water) were mixed with 10 ml of the standard phenol solution which was prepared by dissolving 0.2098 g phenol into 1000 ml water and diluting 100 times with a sodium borate solution. The absorbance of the reaction product at 510 millimicron remained stable up to 24 hr after the reaction, however slightly decreased absorbance was noted after 48 hr. A linear calibration curve was obtained up to 2.1 micrograms phenol. For the phenol vapor analysis, phenol could be trapped by sodium borate solution and determined by the 4-aminoantipyridine method. Trapping efficiency of 100% was achieved for up to 1000 ppm phenol. The technique was applied to determine the phenol level in a flue gas emitted from a phenol resin manufacturing plant which has a phenol removal apparatus for its flue gas. The phenol level in the flue gas before entering the apparatus was 30 ppm, and after the apparatus was 0.3 ppm.

56036 **APTIC NO. 80717**

Hubble, B. R., Stanley Siegel, and P. T. Cunningham

ON THE FEASIBILITY OF THE CASO4-GAS REACTION FOR REGENERATION OF SULFATED DOLOMITE OR LIMESTONE IN SULFUR DIOXIDE POLLUTION CONTROL PROCESSES. *J. Air Pollution Control Assoc., 25(12): 1256-1257, Dec. 1975. 4 refs.*

The feasibility of the calcium sulfate-calcium sulfide reaction for the regeneration of sulfated dolomite or limestone in sulfur dioxide pollution control processes was investigated. The sulfated dolomite was partially reduced at 900 C with 3 vol% hydrogen until the weight change indicated that the concentrations of the phases were near the 3CaSO4/CaS mole ratio. The reaction 3CASO4 plus CaS in equilibrium wiht 4Ca plus 4SO2 was carried out at 950 C under a flow of helium to remove the SO2 that was formed. Calcium oxide yields of 70% by weight, evaluated by ar X-ray diffraction method, were readily obtained. This yield is a respectable value from the viewpoint of potential technical application. Substantial amounts of CaO can also be formed by this method when a reducing gas mixture containing much less than 1 vol% hydrogen is used. Reducing gas mixtures of higher concentrations of H2 resulted primarily in the formation of CaS.

56037 **APTIC NO. 80561**

Huygen, C. and R. W. Lanting

ON THE SALTZMAN FACTOR. *Atmos. Environ., 9(11):1027-1029, 1975. 9 refs.*

The determination of the Saltzman factor was investigated. The nitrite equivalent of nitrogen dioxide in its determination in polluted air by means of a Griess type reagent is commonly called the Saltzman factor. Values ranging from 0.5 to 1.00 have been reported. The Saltzman factor is not a constant. It is inversely related to nitric oxide production and varies according to the expectations and is based on the expounded reactor mechanisms. The reagent containing sulfanilamide rather than sulfanilic acid shows a higher Saltzman factor and lower NO production. The higher the 1-naphthylethylene diamine dihydrochloride concentration the higher the NO production and the lower the Saltzman factor. The effect of temperature is small.

56038 **APTIC NO. 80807**

Iida, Yoshio and Shigeki Daijima

OFFENSIVE ODOR SUBSTANCE ANALYSES BY CHEMICAL IONIZATION GC/MS METHOD. *(Kagaku ionka GC/MS ho ni yoru akushi busshitsu no bunseki). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 194, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975.)*

A chemical ionization technique for mass spectrometric analysis of methyl mercaptan, dimethyl sulfide, and trimethyl amine is described. The mass fragmentation of compounds was done by reaction with methane, which gave characteristic mass spectra that were simpler than those obtained by the conventional mass spectrometry. In the spectra, a strong M+1 peak appeared as well as the weak M+29 and M+41 peaks which were characteristic of the use of methane. Therefore, the detection of methyl mercaptan could be made from the m/e 49, 77, and 89 peaks, of dimethyl sulfide from the m/e 63, 91, and 103 peaks, and of trimethyl amine from the m/e 60, 88, and 100 peaks. With the gas chromatography combination, both qualitative and quantitative analyses were possible. The high analytical sensitivity (pg level) for the compounds could be obtained using the m/e M+1 peak. Using a 1 ml air sample, this means that the ppb level of these compounds could be determined by the chemical ionization GC/MS technique without a pretreatment.

56039 **APTIC NO. 80808**

Inoue, Isamu, Kenichi Ishizuka, and Shizuo Sato

CUMULATIVE METHOD FOR THE DETERMINATION OF NO2 CONCENTRATION IN ATMOSPHERE. *(Taikichu no chissosankabutsu sotai nodo sokuteiho ni kansuru kenkyu). Text in Japanese. Preprint, Japan Society of Air Pollution, Tokyo, p. 286, 1975. (Presented at the Japan Society of Air Pollution, Annual Meetin, 16th, Niigata, Japan, Nov. 5-7, 1975.)*

A simplified analytic method for the relative concentration of airborne nitrogen oxides was investigated at the Kawasaki Municipal Environmental Pollution Research Laboratory. Nitration plates coated with 15 g of 250-300 mesh glass beads, 2 ml of 20% tri-ethanol-amine solution, and 6 ml of tragacanth rubber solution were dehydrated at temperatures of 80-100 C in a desiccator, then hermetically sealed for preservation. These plates were then exposed in the air for a month, after which 50-80 ml of the test material on the plate was collected and prepared for spectrophotometry. The length of exposure of the plates in relation to the amount of NO2 collected indicates that the plates can be exposed for approximately 40 days. The absorption rate of the test material measured by 550 micro- wavelength spectrometry indicates that this analytic method yields an NO2 extraction efficiency of 98%. However, this method will be affected by meteorological factors such as temperature, humidity, and wind direction velocity. Therefore it is useful only to measure the relative concentration of NO2 within a specific area.

56040 **APTIC NO. 73624**

Ixfeld, H. and K. Ellermann

NEW AIR POLLUTION MEASUREMENT METHODS FOR AIR QUALITY MONITORING IN NORTHRHINE-WESTPHALIA. *(Neuere Verfahren zur Immissionsmessung fuer den Einsatz im Rahmen der Luftqualitaetsueberwachung im Lande Nordrhein-Westfalen). Text in German. Schriftenreihe Landesanstalt Immissions und Bodennutzungsschutz Landes Nordrhein-Westfalen, Essen, no. 33:44-47, 1975. 5 refs.*

Three new analytical methods introduced recently in the air quality monitoring network of Northrhine-Westfalia are described. For the determination of benzene, air is sampled for 15 min in a volume of 10 l, and benzene is absorbed on a glass ball from which it is subsequently desorbed in the laboratory by means of helium for gas-chromatographic determination. The desorption at 320 C is quantitative in a concentration range of 17 and 1.7 micrograms/cu m. For the determination of formaldehyde, air is sampled through two LIB type absorber bottles, and formaldehyde is determined by the reversed West-Gaeke tetrachloromercurate method developed for the analysis of sulfur dioxide. Thhe intensity of the red coloration is a measure of the formaldehyde concentration. The limit of detectability lies at 1.4 micrograms/cu m. Formaldehyde and benzene are determined only at a few sampling stations due to the high expenditures involved, while the new method for the determination of cadmium in dust iss applied at all 71 monitoring stations. For the determination of cadmium, air is sampled through LIB type membrane filters, and the dust sample is treated with a mixture of hydrochloric acid and nitric acid for subsequent determination by atomic absorption method. The sensitivity amounts to 0.002 micrograms/cu m against a proposed MAC value of 0.05 micrograms/cu m. A mathematical method has been developed for the conversion of the dust particle count concentration as determined by means of impactor into mass concentration.

56041 **APTIC NO. 73615**

John, Walter

INVESTIGATION OF PARTICULATE MATTER MONITORING USING CONTACT ELECTRIFICATION (INTERIM REPORT). *California State College, Stanislaus Turlock, Environmental Protection Agency Grant R-802726-01, Program Element 1A1010, 52p., Feb. 1975. 55 refs.*

The theory of charging aerosol particles by contact electricity is reviewed along with laboratory experiments designed to develop particulate monitors based on contact electrification. The dynamic response of a contact electricity monitor tested tracked well with that of an optical detector, and the total charge correlated well with the gravimetric mass. Humidity displayed little effect on the monitor response, but droplets caused instrument failure. Precharge on the particles did not influence the detector. Particle size did not exert an important effect on monitor response, although there was a cutoff for very small particles. Monitor sensitivity depended on the electrical resistivity of the test dusts and on the condition of the surface of an Inconel probe used. Sensitivities ranged over a factor of 60 and were predicted by the theory of Cheng and Soo for metals and good semiconductors. (Author abstract modified)

56042 **APTIC NO. 79844**

Joseph, James D., Michael F. Terraso, and W. A. Quebedeaux, Jr.

IDENTIFICATION OF EMISSION SOURCES BY INDUSTRIAL FINGERPRINT. *Preprint, Pollution Control Dept., Harris County, Tex. 27p., 1975. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

The use of atomic emission spectroscopy for the identification of trace constituents characteristic of specific industrial sources of air pollution is discussed. The atomic emission technique is based on the fact that neutral atoms which exist in aqueous solution can emit radiation in discrete steps at different wavelengths. These wavelengths are specific for that particular atom and can be used a an indication of the presence of that atom. The availability of emission and free radical lines appearing at different wavelengths allows the analyst to choose a wavelength that is unobscured by the wavelength of any other atom. The comparison of a given set of results with samples that are known to originate from a particular plant results in a fingerprint of the emissions generated by that plant. The sensitivity and detection limits for any given element vary from less than 0.1 ppm to 25 ppm, depending on the scanning speed. Typical industrial fingerprints of the trace composition of dust samples are illustrated.

56043 **APTIC NO. 79924**

Kanagawa, A., T. Takahashi, and Y. Murase

SAMPLING OF AEROSOL PARTICLES WITH A THERMO-SAMPLER. *(Samo sanpura ni yoru earozoru ryushi no sanpuringu). Text in Japanese. Kagaku Kogaku Ronbunshu (Chem. Eng. Essay), 1(4):337-343, July 1975. 16 refs.*

A description of a new type of thermo-sampler in which aerosols are passed between a hot plate and a cold plate is given, with discussion of the theoretical basis of such measurement. To investigate the performance characteristics of this sampler, the maximum travelling distance and the number distribution of sample particles on the cold plate were measured and analyzed in compariso to Derjaguin and Yalamov s theoretical values. The dependence of the thermal velocity of the particle on the size, and the effect of the thermal conductivity of particles were also investigated. The inlet effect was reduced sufficiently by the increase in maximum travelling distance of particles. In the particle size range of 0.5-1.0 micron, the effect of particle size was negligible; however, effects increased with increase in particle size. The effect of the thermal conductivity of particles of about one micron was relatively small.

56044 **APTIC NO. 73253**

Ketseridis, Grigorios and Juergen Hahn

DETERMINATION OF THE ORGANIC CONSTITUENTS OF AEROSOL PARTICLES FROM CLEAN AIR. *(Bestimmung der organischen Bestandteile von Aerosolpartikeln aus Reinluft). Text in German. Fresenius Z. Anal. Chem., 273(4):257-261, 1975. 14 refs.*

A method for the determination of organic components in particulates in clean air is described. A sample volume of 10,000 to 20,000 cu m air is sampled through glass fiber filter in high-volume sampler, after which the organic components are separated with sulfuric acid, sodium hydroxide, and petroleum ether to obtain a basic fraction and another fraction including acids, phenols, and neutral substances. The ether solution is fractionated into aliphatic, aromatic, and polar fractions by thin-layer chromatography, using a 4:18:2:26 ratio of n-hexane, cyclohexane, toluene and benzene as a solvent system. The different extracts are then analyzed gas-chromatographically by means of flame-ionization detector or a combination of the latter with mass spectrometry. Air samples taken in a clean-air area and an urban area, analyzed by this method, contained 95 to 154 different organc components in the particulates. The percentage of the total organic matter in the particulates was between 7 and 12% in the clean-air area, and between 17 and 20% in the urban area. Naphthalene, alapha-methylnaphthalene, anthracene, phenanthrene, 9-methylanthracene, fluoranthene, pyrene, 1-methylpyrene, chrysene, benzoanthracene, 1,2-perylene, 1,2,5,6-dibenzoanthracene, and 1,12-benzoperylene were detected in almost all samples in both areas.

56045 **APTIC NO. 80785**

Kikuchi, T.

NOX ANALYTICAL DEVICE BY THE CHEMILUMINESCENCE METHOD. *(Kagaku hakkoku ni yoru NOx bunseki keisokuku (1)). Text in Japanese. Otomeshon (Automation), 20(9):18-22, Sept. 1975. 2 refs.*

The analysis of nitrogen oxides in flue gas by a GLE model NOx measuring apparatus is described. Flue gas was sampled by inserting an SUS 316 probe into stacks and dusts in the flue gas were removed by a filter in the probe. The moisture in the flue gas was removed by condensation. Small particles (above 5 micron) were removed by a second filter. The resulting gas was compressed, and most of the gas was released through a by-pass while a portion of the gas was led to a converter where nitrogen dioxide was converted to nitric oxide. The gas was then passed through a third filter where micro particles (above 0.2 micron) were filtered. The resulting gas was introduced to a luminescence cell at constant flow rate. Clean air was dried and introduced to an ozone generator where a portion of oxygen was converted to ozone. The O3 was sent to the luminescence cell where it reacted with nitric oxide to give chemiluminescence. The chemiluminescence was recorded continuously after being converted to a signal, with the aid of an alternative amplifier and a rectifier. The apparatus is applicable for 4 different ranges of NOx concentration with a reproducibility of + or - at full scale, a zero drift of + or - 1% at full scale within one month, and a span drift of + or - 2% at full scale within one week.

56046 **APTIC NO. 80922**

Kimoto, Toshio

DETERMINATION OF SULFUR COMPOUND AND RELATED COMING PROBLEMS. *(Iou kagobutsu no sokutei to sono mondaiten). Text in Japanese. PPM (Japan), 6(11):79-85, 1975. 6 refs.*

Since the first sulfur dioxide analyzer was made for trail in Japan in 1960 by Kimoto Denshi Kogyo, SO2 analyzers have been remodeled and improved yearly in accordance with the revisions of the regulations for sulfur dioxide gas, which is the main cause of air pollution. Gas chromatography with flame photometry, which measures total sulfur, SO2, and hyorogen sulfide with a detection limit below 5 ppb is described. This method is considere most reliable at present and is expected to be in demand in the future. Static and dynamic calibration for analyzers, and batch-type and continuous analyzers are also discussed. Throughout Japan recently the concentration of SO2 has been maintained below 0.05 ppb, which meets the environmental standard. However, it is likely that sulfur oxides exist in the form of sulfates more than as SO2, because the number of people with environmental illnesses has not declined.

56047 **APTIC NO. 80665**

Klainer, Stanley M.

REMOTE RAMAN SPECTROSCOPY -- A CRITIQUE. *Preprint, The American Chemical Society, Washington, D. C., 41p., 1975. (Presented at the American Chemical Society, National Meeting, 170th, Chicago, Ill., Aug. 25, 1975.)*

The advantages and drawbacks of remote Raman spectroscopy are discussed. Raman spectroscopy, infrared techniques, and ultraviolet analysis are compared in tubular form. Molecules are characterized by specific Raman shifts and scattering cross-sections. Raman shifts, Raman shifted wavelengths, and differential scattering cross-sections are listed for a few typical compounds using 6943 angstrom incident wavelength (ruby laser) and a 180 deg observation angle. Remote Raman is best suited for situations where emphasis is on the unambigous identification of compounds which are present in reasonable sample concentrations. The basic components are a pulsed laser source, a receiver telescope, a device for analyzing the scattered light, a low noise detector, and data handling and display instrumentation. Ranging is possible by timing the delay between departure of the pulse and the return of the Raman signal. Sorting of the returning Raman scattering can be performed using filters, grating monochromators, or polychromators. The basic information available from remote Raman spectrometers includes sample identification, sampled concentration, sampled location, and sample volume. Understanding the sensitivity criteria for the remote Raman system is one of the keys to judiciously using this approach. Performance from a typical sample monitoring system is discussed. Possible Raman sensitivities for several compounds as a function of target distance using an optimized system are summarized. Six possible applications of remote Raman are considered: atmospheric temperature measurements, remote humidity measurements, visibility measurements, detection of pollutants, specialized analysis of solutes in water, and high temperature water analysis.

56048 **APTIC NO. 80736**

Kojima, Ko and Toshio Sekigawa

DETERMINATION OF ELECTRICAL CHARGE DISTRIBUTIONS OF AEROSOL. I. *(Earozoru no kenka bunpu no sokutei. I). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 145, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

Experimental determination methods for the electrical charge distribution of particles with radius in the range of 10 to the 7th power to 0.0001 cm in the atmosphere are described. The abovementioned size range was classified into three regions. In the region where double charges were expected, the electrical charge distribution was obtained from the ion mobility distribution, measured by ion analyzer (IA). The mobility distribution of charged particles was measured by Pollack counter and ion Precipitator (IP). In order to remedy the poor resolution of the existing measurement system, two IP and two Pollack counters connected in series were operated simultaneously, measuring particle numbers of different limiting mobility simultaneously. The ratio of double charge was obtained from the mobility distribution of charged particles and the ion mobility distribution obtained by IA.

56049 **APTIC NO. 80526**

Lancaster, B. W.

A NEW DESIGN CONSIDERATION FOR ROTARY IMPACTION FILTERS. *Clean Air (J. Clean Air Soc. Australia New Zealand), 9(3):58, Aug. 1975. 5 refs.*

A new design consideration for rotary impaction filters was analyzed. It is generally expected that rotary impaction filters for fine particle collection require large numbers of very fine collection elements to operate satisfactorily. Analysis of recent information shows this to be incorrect. A filter can be designed whose performance is independent of the diameter of the collecting filaments. Cheap, robust filters can be designed for fine particle collection. By careful selection of design parameters it is conceptually possible to increase collector diameter, thus increasing the probability of adhesion, without seriously reducing the impaction efficiency of a filter. Adhesion of particles up to five micron diameter is possible for collectors of the order of 1 cm diameter at velocities of 25 m/sec.

56050 **APTIC NO. 73550**

Lauer, George and Walter L. Crader

THE AEROMETRIC INSTRUMENT SYSTEM IN THE COMMUNITY HEALTH AIR MONITORING PROGRAM (CAMP). *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 11p., 1975.*

The aerometric instrument systemm of the Community Health Air Monitoring Program (CHAMP) is described. The CHAMP system, which provides valid physical data for correlation with health data, consists of 23 fixed (transportable) and five mobile environmental monitoring stations and a central control station. The monitoring stations are located in Southern California, Utah, Alabama, New York, and North Carolina; and the central control station is located at Research Triangle Park, North Carolina. Automatic instrumentation for the analysis of ozone, nitrogen oxides, sulfur dioxide, carbon monoxide, and hydrocarbons is connected into the system in a configuration that permits continuous recording. The stations are also equipped with a complete calibration system which is designed to permit multipoint calibration of each of the analyzers. The data logger used consists of a minicomputer interfaced to a multiplexer and an analog to digital converter. The CHAMP monitoring stations appear to be providing sufficiently precise and accurate data forr the requirements of the Community Health Environmental Surveillance System communities.

56051 **APTIC NO. 80713**

Lopez, Edward L.

SMOKE EMISSION FROM BURNING CABIN MATERIALS AND THE EFFECT ON VISIBILITY IN WIDE-BODIED JET TRANSPORTS. *J. Fire Flammability, vol. 6:405-450, Oct. 1975. 5 refs.*

The smoke emission of aircraft interior construction materials was investigated under various burning conditions. A wide bodied mockup was used to establish correlations with the National Bureau of Standards type Smoke Chamber. Materials were tested to relate visual acuity to optical density in a wide bodies mockup. A fair correlation exists between the NBS type Smoke Chamber and the mockup for various sizes of materials tested. With eye protection, reasonably good visual acuity is retained with optical densities of 0.30 or less. Without eye protection, irritation is intolerable well before a serious loss of visual acuity. Normal ventilation, typical of that provided by the environmental control system of a wide bodied jet transport, reduces the stratification of smoke particles in the mockup. Because of air circulation, the smoke distribution tends to be more uniform from floor to ceiling than the no ventilation cases. (Author abstract modified)

56052 **APTIC NO. 79842**

Ludwig, C. B. and M. Griggs

APPLICATION OF REMOTE MONITORING TECHNIQUES IN AIR ENFORCEMENT. *Preprint, Science Applications, Inc., La Jolla, Calif. 4p., 1975. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

The application of remote measurement techniques to air enforcement monitoring is discussed. Several modes of remote detection can be employed in enforcement monitoring: direct observation of a plume by passive or active monitors, perimeter monitoring from van-based platforms or airborne platforms, and horizontal active long-path monitoring. Air pollutants that are amenable to remote monitoring in the immediate or near-term time frame include particulates, sulfur dioxide, nitrogen dioxide, carbon monoxide, light hydrocarbons, hydrogen chloride, hydrogen fluoride, ammonia, nitrogen oxides, hydrogen sulfide, nitric acid, ozone, and vinyl chloride. Remote monitoring in the long-term time frame shows potential for the measurement of heavy hydrocarbons, sulfur oxides, certain specific trace elements, and chlorinated hydrocarbons. The most promising laser systems for near-term operational use are differential absorption, lidar, and the laser Doppler velocimeter.

56053 **APTIC NO. 80687**

Malm, William C., Kenneth O Dell, and John S. Hall

THE USE OF A DUAL BEAM LASER TRANSMISSOMETER AS A MEANS OF MONITORING AIR QUALITY. *Preprint, Northern Arizona Univ., Flagstaff, Ariz., Dept. of Physics, 10p., 1975. 13 refs. (Presented at the Environmental Sensing Assessment, Las Vegas, Nev., Sept. 14-19, 1975.)*

Ambient aerosol measurements made with a dual beam conference laser transmissometer were compared with measurements of visibility using an integrating nephelometer as well as with contract techniques utilizing cameras and photometers. The transmissometer was calibrated with a very precise (less than 1% error) two-source telephotometer. The laser transmissometer proved to be superior to visibility and contract techniques and allowed for the measurement of instantaneous values of the extinction coefficient, visibility, aerosol mass loading, and aerosol number distribution. Moreover, these directly measured and derived air quality parameters were spatially averaged over long distances using the transmissometer as opposed to point measurements.

56054 **APTIC NO. 73423**

Matsui, Toru

MONITORING SYSTEM USING MINI-COMPUTER, EXAMPLE OF APPLICATION TO POLLUTION MONITORING SYSTEM. *(Minikon o mochiita keisoku shisutemu, kogai kanshi shisutemu eno oyorei). Text in Japanese. Oyo Butsuri, Tokyo, 44(3):267-268, March 1975.*

Operation of air pollution monitoring systems by computers is discussed. Pollutant data at individual monitoring stations are collected at a central controlling station via telephone cable or radio. Thhe operation is divided into two types; on-line operation and background operation. The former operation performs a real-time indication of individual monitoring stations and data are shown on a digital indication board from time to time. By this operation the high pollutant levels at any station can be noted from the board and necessary measures are ordered to the monitoring stations. The collected data are installed in a memory system in computers, which is later used for the background operation giving statistical pollution data at each station or each area. A back-up system for the computer system is also necessary and such a system records any malfunctioning during the monitoring operation; pollution data installed in computers can be later corrected from the records indicated by the back-up system.

56055 **APTIC NO. 73207**

Matsushita, Hidetsuru

ANALYTICAL METHOD FOR POLYCYCLIC AROMATIC HYDROCARBONS IN THE ATMOSPHERIC SUSPENDED DUST USING HIGH-SPEED LIQUID CHROMATOGRAPHY. *(Kosoku ekitai kuromato gurafi o mochiita taiki fuyu funjin chuno takan hokozoku tanka suiso bunsekiho). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 807. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2013.)*

An analysis of 25 polycyclic aromatic hydrocarbons was performed by high-speed liquid chromatography equipped with an OPS-Permaphase column and an ultraviolet detector with methanol-water solution used as the mobile phase at a pressure of 800 psi. The separation of 25 compounds by the chromatography was done within 30 min giving more than 20 peaks, however some of the peaks were a mixture of a few compounds which consisted of those polycyclic aromatics with more than four benzene rings. Each component in the undissolved peaks could be quantitized separately if a monochrometer was used for the fluorescence signals of those compounds. For example, benzo(a)pyrene, benzo(e)pyrene, and perylene which appeared in a single peak could be determined at 405 nm, 380 nm, and 475 nm respectively. The relationship between the number of carbons and retention times was linear, and the retention times for polycyclic aromatic hydrocarbons were reproducible. A linear calibration curve was also obtained.

56056 **APTIC NO. 80798**

Matsushita, Shukaku and Keiichi Arashidani

A ROUTINE ANALYSIS OF BENZOPYRENE IN AIR-SUSPENDED PARTICULATES BY MEANS OF ULTRASONIC EXTRACTION, TLC AND SPECTROFLUOROMETRY. *(Choonpa chushitsu hakuso kuromato bunkokeikoho ni yoru fuyu funjin chu benzopiren no ruchin bunsekiho). Text in Japanese. Preprint, Japan Society of Air Pollution, Tokyo, p. 374, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 9602.)*

An analytical method for benzo(3-4)pyrene (Bap) in suspended particulates, consisting of ultrasonic extraction double layer one dimensional thin-layer chromatography (2-1 TLC) with spectrofluorometry is described. Descriptions of sampling, ultrasonic extraction, thin-layer chromatographic separation, ultrasonic extraction of Bap, and determination by the base line method using spectrofluorometry are given, with analytical results. The recovery rate of Bap obtained by dividing the sampling in two and adding a known amount of Bap to one of the samples was in the range of 97-103.0%. Analytical results by this method were compared with those by vacuum sublimation--2-1 TLC--spectrofluorometry, and were in fairly good agreement. This method is suitable for routine analysis of Bap in suspended particulates because of the simplicity of analytical method, high accuracy, and short analysis time.

56057 **APTIC NO. 81028**

Matsushita, Shukaku, Keiichi Arashidani, Fujio Otsuka, and Shu Yamada

A SIMPLE DETERMINATION METHOD FOR BENZOPYRENE IN SUSPENDED PARTICULATES. *(Taiki fuyufunjinchu no benzopiren kani bunsekiho). Text in Japanese. Preprint, Japan Society of Air Pollution, Tokyo, p. 348, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 9603.)*

The analytical procedure for benzo(3-4)pyrene (Bap) in suspended particulates consists of four basic steps: extraction of polycyclic aromatic hydrocarbons (PAH), separation of Bap, and determination of separated Bap. With a new simplified method, the PAH in suspended particulates is directly extracted and separated on a double layer one-dimensional thin-layer chromatoplate, and the extract of separated Bap is analyzed by X-ray fluorescence spectrometry. The sampling procedure, preparation of the thin-layer plate, and the analytical method are described, with results of five simultaneous determinations of known samples. The recovery rate of Bap was in the range of 98.7-103.4% (mean value 99.9%) and the coefficient of variation was in the range of 1.5-4.3% (mean value 3.3%). This method is suitable for simultaneous analysis of a number of suspended particulate samples.

56058 **APTIC NO. 75950**

McKee, H. C., R. E. Childers, and V. B. Parr

COLLABORATIVE STUDY OF REFERENCE METHOD FOR MEASUREMENT OF PHOTOCHEMICAL OXIDANTS IN THE ATMOSPHERE (OZONE-ETHYLENE CHEMILUMINESCENT METHOD) (TEST REPORT). *Southwest Research Inst., San Antonio, Tex., Environmental Protection Agency Contract CPA 70-40, Program Element 1HA327, Rept. EPA-650/4-75- 016, 51p., Feb. 1975. 10 refs.*

NTIS: PB 244105/AS

Information is presented on collaborative tests to determine the precision and bias of the reference method for measurement of photochemical oxidants. Ten collaborators were assembled at a common site to measure ambient and ozone supplemented concentrations over a range from 0 to .510 ppm. The data were analyzed to derive an estimate for the precision of the method. Estimates of the standard deviations of the process for total, between laboratory, and within laboratory were derived. The lower detectable limit was 0.0065 ppm. The second phase consisted of a collaborative test involving eleven laboratories to determine the accuracy of the method. Ozone generating systems which had been calibrated by the National Bureau of Standards were supplied to each collaborator. Five concentration levels known to the test designer were measured at each laboratory. Ten laboratories completed the test, and useful data were supplied by nine laboratories. A systematic negative bias exists in the method over the range of 0 to 0.500 ppm. The upper limit of the 95% confidence interval on the observed average values of the concentration levels over all laboratories ranged from 9 to 29% below the true values, and the lower limit varied from 20 to 45% below the true values. The mean percentage difference between the average observed value and the true value at the five concentration levels ranged from 15.9 to 37.3%. (Author abstract modified)

56059 **APTIC NO. 73650**

McRanie, Richard D., John M. Craig, and George O. Layman

EVALUATION OF SAMPLE CONDITIONERS AND CONTINUOUS STACK MONITORS FOR THE MEASUREMENT OF SULFUR DIOXIDE, NITROGEN OXIDES AND OPACITY IN FLUE GAS FROM A COAL-FIRED STEAM GENERATOR. *Southern Services, Inc., Birmingham, Ala., Research Dept., 265p., Feb. 1975.*

The effectiveness of sample conditioners and continuous stack monitors for the measurement of sulfur dioxide, nitrogen oxides, and opacity in flue gas from a coal-fired steam generator is reported. Individual evaluations of the seven sample conditioners, nine SO2 analyzers, nine NOx analyzers, and two opacity monitors included are presented. Analyzer accuracy and sample conditioner influence testing formed an integral part of the evaluation. Reliable and accurate continuous stack monitoring systems cannot be purchased off the shelf from any manufacturer. They must be specified to the minutest detail. The SSI sample conditioner is the only sample conditioner recommended for use on a coal-fired steam generator. It seems to have no effect on the components of interest in flue gas. The analyzers determined to be most satisfactory with the SSI sample conditions for SO2 are DuPont, Mine Safety Appliances, and Beckman; for NOx Thermo Electon and DuPont, and for opacity Lear Siegler. Design and operation recommendations for a monitoring system are included and the analytical techniques used in continuous stack monitoring are discussed.

56060 **APTIC NO. 80633**

Miller, John M.

THE COLLECTION AND CHEMICAL ANALYSIS OF PRECIPITATION IN NORTH AMERICA. *Preprint, American Inst. of Chemical Engineers, New York, 21p., 1975. 4 refs. (Presented at the American Institute of Chemical Engineers, 1975 Conference, Complete Water Reuse: Water s Interface Energy, Air, Solids, 2nd National Conference, Chicago, Ill., May 7, 1975.)*

The design and operation of precipitation networks in North America are reviewd. A network in the United States consisting of 10 stations is under the joint management of the National Oceanic and Atmospheric Administration and the Environmental Protection Agency. Samples are analyzed at the EPA laboratory in Raleigh, North Carolina. Environment Canada is operating six regional stations. Specialized networks for investigating pollutant washout downwind of individual sources and deposition patterns of tracers released in clouds are also established throughout North America. The collectors used in various networks fall into four classes: continuously open or bulk collectors, open-close samplers, wet-dry collectors, and special collectors designed for particular applications such as sequential sampling and directional sampling. Standard practice in the evaluation of precipitation chemistry data is to calculate a weighted mean of the concentration of a given constituent rather than a straight mean.

56061 **APTIC NO. 80758**

Minoura, Tsutomu

DETECTING APPARATUS OF THE GAS COMPOUNDS. *(Kitai sosei kenshutsu sochi). Text in Japanese. (Nagano Keiki Seisakusho Ltd. (Japan)) Japan. Pat. Sho 50-17158. 3p., June 18, 1975. (Appl. April 24, 1970, 1 claim).*

A simple gas detector for carbon dioxide is described. Gas in a negative pressure chamber is released from the exhaust pipe when fan on one side of the chamber rotates with the aid of a generator. The action causes strong negative pressure in the chamber, which in turn causes a valve body to leave a valve seat on the other side of the chamber. This results in the suction of external air into the chamber; the pressure is kept at a constant value. Combustion gas and standard air are introduced from the bottom of the device through a heat exchanger consisting of a heat exchanging chamber and a spiral heat exchanging fin. The two gases become the same temperature before entering a gas duct and being sprayed into the negative pressure chamber through a nozzle. The gas moves a plate at the bottom of the chamber; the inclination of the plate moves an indicator to the proper CO2 value.

56062 **APTIC NO. 80781**

Miyazaki, Motoichi, Hiroyuki Nakazawa, and Yasuhiro Yamane

GAS CHROMATOGRAPHIC ESTIMATION OF IRON IN AIRBORNE PARTICULATES. *Chem. Pharm. Bull., 23(10):2436-2438, Oct. 1975. 8 refs.*

The feasibility of gas chromatographic estimation is reported for iron in airborne particulates. The particulate is ashed in an electric furnace and digested with nitric acid. The acidic digest is neutralized with sodium hydroxide, and bufferized with acetate buffer at pH 4.5, and then treated with 0.5% trifluoroacetylacetone(TFA)-benzene solution to extract iron as Fe TFA chelate. The extracted chelate is submitted to gas chromatography. Some observations are made on the gas chromatographic conditions. (Author abstract)

56063 **APTIC NO. 80776**

Myerson, Albert L. and James J. Chludzinski, Jr.

A GAS CHROMATOGRAPHIC DETERMINATION OF HCN IN COMBUSTION EFFLUENTS IN THE LOW PPM RANGE. *J. Chromatographic Sci., 13(11):554-555, Nov. 1975. 5 refs.*

A gas chromatographic technique for the rapid and dependable determination of as low as 10 ppm hydrogen cyanide is described. The gas chromatograph is equipped with a flame ionization detector. The convenience and the precision of the results represent a significant improvement over those obtained by conventional chemical means. A sample can be taken from the gas stream at any time by means of a gas sampling valve. This analysis can be carried out at less than 20-minute intervals with a single column and apparatus, in the presence of species normally found in the effluents of hydrocarbon combustion. (Author abstract modified)

56064 **APTIC NO. 73296**

Nagami, Koji and Fumio Muramatsu

PROBLEMS OF DETERMINATION OF ATMOSPHERIC COPPER BY COMMERCIAL HIGH VOLUME AIR SAMPLERS. *(Shihan hai boryumu ea sanpura ni yoru taikichu no do no teiryo no mondaiten). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:39, Feb. 1975.*

The copper emission from the motor which operates a high volume air sampler was studied for the interference effect on the determination of copper in airborne dust collected by the high volume air sampler. The copper emission from the motor was determined to be 0.47 to 0.59 mg/hr, which was the cause of the higher analytical value observed in the copper level in airborne dust when the high volume air sampler was used. Therefore, the copper determination must be made by other methods.

56065 **APTIC NO. 80936**

Nakajima, Hiroto

MEASURING METHOD OF OXIDANT AND ITS PRESENT STATUS. *(Okishidanto sokuteiho to jissai). Text in Japanese. PPM (Japan), 6(11):60-66, 1975.*

Analytic methods and instruments for measuring oxidants, including ozone, peroxides, chlorine, nitrogen dioxide and peroxyacetyl nitrate (PAN) are discussed. At present, the prevalent method is absorption spectrometry using potassium iodide solution. The standard analytic methods include the use of a continuous oxidant meter of Japanese environmental standard specifications, selected methods from the conventional standards of the U. S., the federal register method of the U. S. environmental standard, and use of an automatic oxidant meter made by JIS. An oxidant meter, model GX-7 by Denki Kagaku Keiki, which uses potassium iodide solution, is described, and its principle, design features, operation, performance, static and dynamic calibration, maintenance and operation are discussed. Other oxidant analyzers investigated are the ozonometer (model GLX-11 by Denki Kagaku Keiki), which uses the chemiluminescence method, and an oxidant meter based on electrochemical measurements.

56066 **APTIC NO. 73340**

Nakamura, Hideo and Tsuneo Inaba

AUTOMATED DETERMINATION OF SOOT AND DUST. *(Baijin jido sokutei). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(2):106-114, 1975. 3 refs.*

The measurement method for particulate concentration from stationary emission sources, such as the case of flue gas, is standardized in JIS Z 8808. Based on the JIS method, an automatic continuous measurement instrument with high reliability was developed by which complicated manual procedures are eliminated. Descriptions of the automatic continuous measurement instrument model 9211 and compact automatic measurement instrument for suspended particulate model 9221 developed by Mitaka Kogyo Co. and particle mass monitor PM-37 developed by Celesco Co. (U.S.A.) are given. The model 9211 consisting of an equilibrium type sampling device (suction at constant rate), a detection device (the mass of filter paper before and after sampling are sent out as output electrical signal), a sample gas cleansing device (removal of moisture and corrosive gases), a gas suction device (measurement of gas flow rate), and a calculation and recording device is described with a flow sheet, specifications, and functional illustrations. Descriptions of model 9221, designed for suspended particulate measurement, and the particle mass monitor model PM-37 are also given with flow sheets and specifications.

56067 **APTIC NO. [illegible]**

Nakatani, Shigeru and Tomoyoshi Tsunoda

ATMOSPHERIC ELECTRICAL CONDUCTIVITY AS AN INDEX OF AIR POLLUTION. *(Kogaikan no shihyo to shiteno taiki denki dendodo). Text in Japanese. Preprint, the Japan Society of Air Pollution, Tokyo, p. [illegible], 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Japan, Nov. 1-3, 1975, Paper 9604.)*

The number of suspended particulates contributing to weight concentration is only about 10%; however, atmospheric electrical conductivity provides information concerning all suspended particulates. Effects of atmospheric motion and ion pair formation rates on the electrical conductivity were investigated by measuring radiation intensity, particulate concentration using a Pollack counter and a diffusion box, and mean grain radius. The lifetime of ions was calculated from aerosol concentration and mean grain radius. No effect of radiation intensity on conductivity was observed, which was considered to be attributable to the contradicting effects of ion transport by atmospheric vortex diffusion and ion formation by radiation. However, a good correlation was found between conductivity and the lifetime of ions (given as functions of grain radius and its concentration). The electrical conductivity is determined by grain radius and concentration, and it is inversely proportional to number concentration at a given grain radius and to grain radius at a given number concentration.

56068 **APTIC NO. [illegible]**

Oikawa, Kikuo, Yoshihiko Oyagi, Hiroshi Tanaka, Eiichi Hoshino, and Shigeru Araki

STUDIES ON ENVIRONMENTAL MERCURY ANALYTICAL METHOD. *(Kankyo suigin bunsekiho ni kansuru kento). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 304, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975, Paper ID01.)*

The silver amalgam method for mercury vapor analysis was studied. The mercury compounds in simple gas were thermally decomposed by passing them through a heating furnace filled with copper oxide and silver wire, then through a magnesium perchlorate layer or dry ice to remove the moisture from the gas, before the mercury was trapped in tube filled with silver wire. Using this mercury collection apparatus, the effects of moisture and sulfur dioxide in the sample gas on the mercury collection efficiency were examined. The mercury amalgam method was compared with the activated carbon method and potassium permanganate method for mercury collection.

56069 **APTIC NO. 73266**

Otoshi, Tsunehiko and Yoshikazu Hashimoto

TRIAL PREPARATION OF THE COMMON SAMPLE FOR ATMOSPHERIC METAL ANALYSIS. PART 2: NEUTRON ACTIVATION ANALYSIS OF A COMMON SAMPLE. *(Taikichu kinzoku bunsekiyo kyotsu shiryo no shisaku, 2, kyotsu shiryo no hoshaka bunseki). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 813, 1975. (Presented at the Japan. Chemical Society Spring Term Annual Meeting, Tokyo, Japan, April 1-4, 1975, Paper 2026.)*

A common sample of airborne particulate is prepared and analyzed by four different laboratories for 30 elements by neutron activation analysis to determine the analytical variation of the data. For the data at one laboratory, five elements were determined within 5% determining variation, four elements were within 5% to 10%, and 7 elements were within 10% to 30%. The variation among all four laboratories were greater than 5%, and no element could be determined within 5% determining variation; only four elements were determined within 5% to 10% variation.

56070 **APTIC NO. 79847**

Pitman, R. H., M. O. Varner, R. W. Nelson, M. A. Yeager, and R. B. Walton

THE CONTINUOUS MONITORING OF SULFUR DIOXIDE AND SUSPENDED PARTICULATES NEAR NONFERROUS SMELTERS. *Preprint, Asarco, Inc., Salt Lake City, Utah, Dept. of Environmental Sciences, 7p., 1975, 1 ref. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Instrumentation for the continuous monitoring of sulfur dioxide and suspended particulates near non-ferrous smelters is described. Particulates are monitored with a low-volume air filter system which consists of a filter holder, pump, dry test meter, and pulsation dampener. Air at the rate of 1 cu ft/min is drawn through a 4-inch Gelman metricel filter. A respirable or particle size selective unit which operates at about 0.3 cu ft/min is also available. The filters are normally changed once per week or once every two weeks. The system provides an accurate estimate of the average concentration of particulates over a single week or 2-week period, although it does not permit one to determine a maximum 24-hour concentration. The SO2 monitor is a conductimetric analyzer which is relatively maintenance free and has an average reliability of 96.7%. Typical annual average SO2 concentrations measured with the analyzer in the vicinity of a copper smelter rang from 0.005-0.013 ppm.

56071 **APTIC NO. 80559**

Rajhans, G. S. and G. M. Bragg

A STATISTICAL ANALYSIS OF ASBESTOS FIBER COUNTING IN THE LABORATORY AND INDUSTRIAL ENVIRONMENT. *Am. Ind. Hyg. Assoc. J., 36(12):909-915, Dec. 1975. 10 refs.*

The standardized method of measuring airborne asbestos fibers involves drawing a metered flow through a membrane filter of standard type for a fixed period of time. The membrane filter is then removed from the filter holder, sectioned, and mounted on a slide. Sections of the filter are counted visually under a microscope. The experiments performed were divided into Series I, II, and III. Series I experiments were performed with different operators following the recommended procedures. Five operators, all experienced in particle counting, were assigned the task of counting fibers from segments of the same filter. Series II was designed to minimize the nonrandom variations indicated by Series I. Series III consisted of a group of tests run in four separate industrial establishments using asbestos to determine those variations which originate in the field. The standard deviation of the Series III results varied between 0.4 and 1.2 fibers per ml. The standard deviations of the Series II counts were approximately 0.2 fibers per ml. The standard method is sufficiently precise for industrial measurements. (Author abstract modified)

56072 **APTIC NO. 80563**

Severs, R. K. and J. C. Peng

PHOTOCHEMICAL OXIDANTS, AEROSOL, AND OPTICAL DEPTH. *Chemosphere, 4(5):265-270, Oct. 1975. 12 refs.*

The relationship between optical depth and photochemical oxidants and aerosols was investigated. Simultaneous measurements of ground level ozone concentration and optical depth due to light scattering by aerosols (T P) at various wavelengths indicated a distinct relationship between levels of O3 greater than 0.1 ppm by volume and the difference in the optical depth profile between 0.3800 and 0.5000 micron, when T P is greater than some predetermined value characteristic of the area or region. This relationship is attributed to aerosol growth which accompanies photochemical smog formation. Optical depth measurements at various wavelengths are proposed as a unique method to indicate the intensity of photochemical smog. Comparison of the T P data collected in Houston with the standard background aerosol optical depth data indicate that the probability of photochemical smog formation is quite low when T P (.5000) less than .20 since the characteristic shape of the function is still conserved with the recognizable minimum at 0.6000 micron. A positive change between T P (.3800) and T P (.5000) indicates a low probability for the presence of a photochemical aerosol formation. Criteria were established which may indicate the degree of photochemical aerosol formation.

56073 **APTIC NO. 73225**

Shinoyama, E.

RECENT ADVANCES IN MEASUREMENT DEVICES FOR AUTOMOTIVE EXHAUST GASES. *(Jidosha haigasu sokutei kiki no saikin no shinpo). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(6):11-17, Feb. 1975.*

Various analytical methods for measuring automotive exhaust pollutant components are described, and their value is evaluated. Methods described include non-dispersive infrared spectrometry, flame ionization detection, and chemiluminescence for measuring concentrations of carbon monoxide, carbon dioxide, hydrocarbons, and nitrogen oxides. Sampling techniques described include the total bag sampler, constant volume sampler, and proportional sampler.

56074 **APTIC NO. 80524**

Siewert, Robert M.

HYDROGEN INTERFERENCE IN CHEMILUMINESCENT NOX ANALYSIS. *Combustion Flame, 25(2):273-276, Oct. 1975. 4 refs.*

Hydrogen interference in the chemiluminescent nitrogen oxides analysis of undiluted exhaust gas was investigated. Samples of 40% H2 in nitrogen were passed through an analyzer. After stabilizing with air for 1 min, H2 was again passed through the analyzer for 1 min, followed immediately by a mixture of 205 ppm nitrogen dioxide in N2. Immediately following H2 exposure, zero nitric oxide is detected for several minutes after the start of the NO2 purge. Thereafter measured NO increases gradually with time. Comparable interferences occur after H2 exposure when purging with NO in N2 rather than NO2 in N2. No H2 interference is observed while measuring NO with the converter by-passed.

56075 **APTIC NO. 73265**

Souda, Reisuke

ANALYSIS OF LOW CONCENTRATION VINYL CHLORIDE MONOMER IN THE ATMOSPHERE. *(Kankyo kukichu teinodo enka biniru monoma no bunseke). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 815, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2028.)*

An atmospheric vinyl chloride monomer collected into a fluoride bag is analyzed by a gas chromatograph equipped with a flame ionization detector and a Porapack-Q column (3mm by 2m). The standard vinyl chloride gas was prepared from a permeation tube of vinyl chloride monomer. The retention volume of vinyl chloride was 100 ml from the air peak on the chromatogram. The determining variation for a vinyl chloride level greater than 1 ppm was within 5%, and the detection limit of vinyl chloride was 0.2 ppm at the signal to noise ratio of 5.

56076 **APTIC NO. 80715**

Stauff, J. and W. Jaeschke

A CHEMILUMINESCENCE TECHNIQUE FOR MEASURING ATMOSPHERIC TRACE CONCENTRATIONS OF SULFUR DIOXIDE. *Atmos. Environ., 9(11): 1038-1039, 1975. 6 refs.*

A new chemiluminescence method to determine absorbed sulfur dioxide in the liquid phase was developed and compared to the West and Gaeke method. During the Atlantic expedition with the research ship Meteor in the fall of 1973, 1 cu m SO2 free marine air was bubbled through tetrachloromercurate (TCM) solutions containing known concentrations of SO2. There was good agreement between the actual SO2 concentration and the analyzed concentration using the chemiluminescence method. The dichlorosulfitomercurate complex was stable. A large discrepancy between the known values of SO2 and those found photometrically showed that dye development rather than the collection of SO2 with TCM solution was affected. Sulfur dioxide traces can be measured in unpolluted air where the pararosaniline method fails to produce meaningful results.

56077 **APTIC NO. 73547**

Stevens, Robert K.

INSTRUMENTATION TO MEASURE GASEOUS AND PARTICULATE POLLUTANTS FROM AIRBORNE PLATFORMS - A REVIEW. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 5p. 1975.*

Instrumentation for measuring gaseous and particulate pollutants from aircraft is reviewed in terms of operational characteristics and areas where further development is required. Current monitors for hydrocarbon measurements are based on flame ionization detection, the Federal reference method, which is considered unreliable for concentrations below 0.5 ppm. Ozone and nitrogen oxides are currently monitored with chemiluminescent techniques which are used in the Federal reference method for photochemical oxidant measurements and are proposed as a replacement for the Federal reference colorimetric method of NOx measurement. Instrumentation for carbon monoxide measurement includes techniques based on nondispersive infrared spectrophotometry, conductivity, and gas chromatography. The first is vibration sensitive, while conductivity is non-specific and offers inadequate sensitivity. Gas chromatography gives a slow response time and is altitude sensitive like most off the other methods used for gas measurements. Techniques for sulfur dioxide measurement are based on conductivity, flame photometry, and electrochemical procedures. The most sensitive of these, flame photometry, is only marginal and is also altitude sensitive. High volume sampling for the collection of particulates appears to be marginally adequate for routine monitoring. Conversion of gaseous SO2 and nitrogen dioxidee to sulfates and nitrates respectively on the glass fiber collection surface may provide an over-estimate of the particulate loading.

56078 **APTIC NO. 80658**

Sweitzer, Terry A.

THE EVALUATION OF GAS BUBBLER FIELD PERFORMANCE. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., East Central Section, 13p., 1975. 4 refs. (Presented at the Air Pollution Control Association East Central Section Meeting, 32nd, Dayton, Ohio, Sept. 17-19, 1975.)*

Internal gas bubbler temperatures were measured for varying ambient air temperature and operating conditions. The temperature of the gas bubbler's sampling chamber averaged about 95 F (35 C) and often exceeded 112 F (45 C). Samples stored at various temperatures were analyzed with time. As the temperature increased above 80 F (27 C), the sulfur dioxide solution decay rate was also greatly increased. The decay rate was approximately 30%/day at a constant temperature of 112 F (45 C). The elevated internal temperature of the gas sampler, which caused the instrument to give low SO2 readings, was corrected by relocating the bubblers in a controlled indoor environment, and refrigerating the exposed samples as soon as possible.

56079 **APTIC NO. 73214**

Uehara, Hiromichi and Yasuharu Ijuin

TRIAL MANUFACTURE OF A K BAND STARK VOLTAGE SWEEPING MICROWAVE CAVITY SPECTROMETER TO DETECT GASEOUS POLLUTANTS. *(Osen kitai kenshutu no tameno K bando shutaruku denatsu soin makuroha kudo bunkoki no shisaku). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 790, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 1044.)*

A K-band (24 GHz band) spectrometer was constructed. The microwave cavity is 1 by 2 by 45 cm and serves as the cell for gaseous samples. The cavity walls are made of silver coating which is further coated by gold and a Stark electrode is placed in the middle of the microwave cavity. The microwave source used is the NEC 24V20 which oscilates at 22.5 to 26.5 GHz. By sweeping the applying voltage, signals at the 24 GHz band can be induced for dinitrogen oxide, sulfur dioxide, ozone, ammonia, hydrogen cyanide, formaldehyde, and propenal. For example, a strong absorption signal attributable to the N2O transition between the 0,1 (J and F) state to the 1,2 state was observed.

56080 **APTIC NO. 80514**

Ward, T. V. and H. H. Zwick

GAS CELL CORRELATION SPECTROMETER: GASPEC. *Appl. Opt., 14(12): 2896-2904, Dec. 1975. 22 refs.*

A new gas filter correlation spectrometer (GASPEC) for the remote detection of trace vapors in the atmosphere by means of natural emission in the infrared is described. Unique optical features of the GASPEC include two detectors using a single focal plane chopper plus an optical reference for electronic gas balancing. Continuous sensor balance and calibration are achieved along with the source radiometric and target gas information. Several GASPEC instruments were built and tested including devices to sense methane, hydrogen chloride, carbon monoxide, and ethane (C2H6). Preliminary data taken with these sensors are presented. (Author abstract modified)

56081 **APTIC NO. 79849**

White, R. K.

ANIMAL WASTE: ODOR ANALYSIS AND CONTROL. *Preprint, American Inst. of Chemical Engineers, New York and Environmental Protection Agency Research Triangle Park, N. C., 7p., 1975. 12 refs. (Presented at the Complete Watereuse: Water s Interface with Energy, Air and Solids, National Conference, 2nd Chicago, Ill., May 4-8, 1975.)*

Problems dealing with the analysis and control of odorous pollutant generated from animal waste are discussed. Topics covered include: techniques for the representative sampling of odors at ambient temperatures, odor analyses using gas chromatography and mass spectrometry, organoleptic evaluation, and the development of air quality models for quantitatively evaluating the odor nuisance potential of animal wastes as a constraint on land-spreading operations. Odorous compounds identified in anaerobic dairy manure volatiles include: hydrogen sulfide, methyl sulfide, diethyl sulfide, propyl acetate, n-butyl acetate, methyl mercaptan, pentyl mercaptan, trimethylamine, ethylamine, pyruvaldehyde, caproaldehyde, benzaldehyde, and acetophenone. Diethyl sulfide appears to be the principal odorus component of dairy manure volatiles and is a probable candidate as an indicator compound for dairy waste odors. Odor control techniques involve the proper management of confinement buildings and open feedlots and consideration of the prevailing meteorological conditions.

56082 **APTIC NO. 80565**

White, W. H.

ESTIMATING THE SIZE RANGE OF SMOG AEROSOL PARTICLES WITH A PAIR OF SUNGLASSES. *Atmos. Environ., 9(11):1036-1037, 1975. 4 refs.*

During summer and fall, it is common for the San Gabriel mountains, north of Los Angeles, to disappear from view during the morning as the smog builds up. A person wearing polarizing sunglasses can frequently cause the mountains to appear or disappear at will, by tilting his head one way or another. The angle which maximizes the visibility of the mountains as a whole also minimizes the detail that can be seen on their slopes. Conversely, at the angle which maximizes the detail to be seen on the slopes, it may be impossible to discern the mountains themselves against the sky. This makes it possible to estimate the degree to which the glare of the smog is polarized and to estimate the size of the smog aerosol particles.

56083 **APTIC NO. 79918**

Wilshire, Frank W., Joseph P. Lambert, and Frank E. Butler

RAPID RADIOCHEMICAL SEPARATION OF SELECTED TOXIC ELEMENTS IN ENVIRONMENTAL SAMPLES PRIOR TO GAMMA RAY SPECTROMETRY. *Anal. Chem., 47(14):2399-2403, Dec. 1975. 9 refs.*

The radioactive isotopes of arsenic, cadmium, mercury, selenium, iodine, and zinc are chemically separated by using the liquid anion exchanger, triisooctylamine, following sample combustion. Significant improvements over currently used procedures include a radiochemical separation that is quantitative in that all of the products trapped during combustion are contained in one of three sample fractions; an isolation of elements of interest from those elements with interfering gamma energies; a procedure that has few chemical manipulations, thus minimizing related errors; a separation that is simple and requires less than 5 minutes to complete following combustion. The elements contained in liquid samples can be separated directly by liquid anion exchange, eliminating the combustion procedure. The methodology was tested by radiotracer experiments and by analyzing independently tested and certified coa and fly ash samples. (Author abstract modified)

56084 **APTIC NO. 79927**

Yamada, M., S. Iguchi, and T. Maeda

DEVELOPMENT OF CONTINUOUS MASS EMISSION MEASUREMENT PROCEDURES. *(Renzoku masu emishion sokuteiho no kaihatsu). Text in Japanese. Toyoto Gijutsu (Toyota Eng.), 24(4):624-632, July 1975. 2 refs.*

Continuous mass emission measurement procedures designed for the measurement of pollutants in automotive exhaust gas emitted at each driving mode are described. Descriptions of the constant volume sampling continuous analysis method, carbon dioxide tracer method, and fuel-based mass emission measurement method are given with the principles of measurement and characteristics of each method. Measurement accuracies of the CO2 tracer method and fuel-based method were experimentally evaluated. The accuracy of the CO2 tracer method determined with reference to the value obtained by th CVS bag method was + or - 10% for carbon monoxide and hydrocarbons at high emission levels and + or - 20% for CO and + or - 30% for HC at low emission levels. The accuracy of the fuel-based method was also + or - 10% for CO and HC at high emission levels, + or - 20% for CO, and + or - 30% for HC at low emission levels.

56085 **APTIC NO. 80919**

Yamada, Tsuyoshi

ON THE ESTIMATION METHOD DEVELOPMENT OF NITROGEN OXIDES CONTAMINATION. *(Chisso sankabutsu osen yosoku shuho no kaihatsu). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), vol. 1975:61-65, Nov. 1975.*

The Committee for Development of Nitrogen Oxides Pollution Estimation Methods of the Industrial Pollution Prevention Association has commenced research and development of a useful estimation method for nitrogen oxides. The research and investigation projects of the committee are summarized. They include construction of simulation models for diffusion of gas, on-site analysis of NOx concentrations at 400 stationary sources of NOx, investigation of NOx concentrations at 40 monitoring stations, observation of meteorological factors and measurement of the speed of photochemical reactions. The following five factors are considered most important for this research and investigation: the amount of NOx exhausted from stationary and mobile sources, accurate measurement of NOx concentrations, accurate diffusion parameters, construction of an accurate model to simulate photochemical reactions, and development of multiple simulation models for various time and space scales.

56086 **APTIC NO. 80742**

Yamamoto, Hideo, Akira Suganuma, and Yoshiro Mori

PARTICLE SIZE DISTRIBUTION MEASUREMENT OF AIRBORNE DUST BY CASCADE IMPACTOR: SIZE DISTRIBUTION OF AGGREGATE SECONDARY PARTICLES. *(Kasukeido inpakuta ni yoru fuyu funjin no ryudo sokutei: Gyoshu 2-ji ryushi no ryudo bunpu). Text in Japanese. Kagaku Kogaku Ronbunshu (Chem. Eng. Essay), 1(6):638-643, Nov. 1975. 8 refs.*

The size distribution of aggregated secondary particles in airborne dust was determined by collection with a 5-stage cascade impactor. Results were compared to those obtained from the liquid-phase Coulter counter method, which measures sizes of primary particles. Nozzle diameters varied from 0.65 cm for the first stage (particle diameter 5.9 micron) to 0.27 cm for the fifth stage (particle diameter 1.5 micron), at 50% partial separation efficiency. Distance from the nozzle to the collection plate was 3 times the nozzle diameter. After the fifth stage, microparticles were collected with a membrane filter (0.2 micron). Outlet gas flow rate was maintained at 6 l/min. Dust (sand-talc mixture) was generated from a vibrating microfluidized bed. Standardized air (24 C; 60% humidity) was supplied to the bed at a rate of 1.5 l/min. Dust was sent to the impactor through a pipe (30 cm long; I.D. 1.5 mm) or two pipes. In most cases, particle size distribution arising from the fluidized bed did not agree with the original particle size distribution placed in the bed. Further, most of the airborne dust was in the form of aggregated secondary particles, and size distribution depended on the conditions of dust generation. When carrier gas velocity through the pipe was 28 m/sec, airborne dust dispersed almost completely. Particle size distribution measured by cascade impactor closely corresponded to results from the liquid-phase method.

56087 **APTIC NO. 73297**

Yamauchi, Fumio and Yasumitsu Katsuno

AN ANALYZER FOR TRACE MERCURY. *(Goku biryo suigin bunsekikei). Text in Japanese. (Mitsubishi Chemical Industry Ltd., Tokyo (Japan)) Japan. Model Util. Sho 50-4387. 2p., Feb. 5, 1975. (Appl. Oct. 3, 1970, 1 claim).*

A mercury vapor analyzer utilizing atomic absorption spectrometry is described. The analyzer consists of a reducing reaction vessel, gas drier, sample introducing unit, reagent introducing unit, and conventional atomic absorption unit, which are connected through vacuum lines. In the reaction vessel, mercury sample is mixed with a stannous compound in acid solution to reduce mercury and mercury vapor vaporized as the gas drier enters the absorption cell. By using a timer to regulate the valves in the vacuum lines, an automated mercury analysis is possible by this apparatus, and mercury at a ppm level can be determined. Any sample containing Hg (+2) can be analyzed by this analyzer.

56088 **APTIC NO. 79948**

Yamazoe, F. and H. Mayumi

STUDIES ON THE METHODS OF IDENTIFICATION OF PLANT DAMAGES DUE TO AI POLLUTION PART II. ANALYSES AND IDENTIFICATIONS OF HARMFUL SUBSTANCES IN POLLUTED PLANTS. SUBPART 1. DETERMINATION OF SULFUR IN PLANTS BY COMBUSTION METHOD. *(Taikiosen ni yoru shokubutsu higa no kenteiho ni kansuru kenkyu: II Osenshokubutsuchu no yugai seibu no bunseki kanteiho 1. Nenshoho ni yoru io no teiryo). Text in Japanese. Nogyo Gijutsu Kenkyu Hokoku B, no. 27:3-7, Sept. 1975. refs.*

In order to shorten the time required for determining the sulfur content of plants, a process now depending on the weighing of barium sulfate, an iodimetric method for determining the sulfur by combustion is examined. The findings using a combustion sulfur analysis, are as follows: (1) As the standard specimen for sulfur in plants, a mixture of methionine and magnesia in the ratio of 1:9 is appropriate. (2) The best concentration of potassium iodate was 0.01N. (3) To remove substances which turn the iodine-starch solution dark blue and make the determination impossible, the iodine-starch solution should be renewed. (4) The time required fo determination of one specimen was 20 minutes, and the method was fa more efficient than the barium sulfate method, with small differences in the obtained values. (5) The iodimetric method requires only a small specimen, 0.2 - 0.3 g Bacilitating the use of specimens from many sampling points.

56089 **APTIC NO. 73269**

Yanagisawa, Saburo, Tsuneo Shirai, Shinichiro Toyosawa, Yoji Umezawa, and Kazumitsu Ikoma

ANALYTICAL METHOD FOR ATMOSPHERIC ORGANIC DUSTS: SAMPLING TECHNIQUE FOR WORN TIRE TREAD DUSTS. *(Taikichu yukibutsu funjin no bunseki hoho taiya funjinshiryo no shori hoho ni tsuite). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 808, 1975. (Presented at the Japan. Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2014.)*

The thermal pyrolysis of styrene-butadiene rubber (SBR) for gas chromatographic analysis is studied. The thermal pyrolysis of SBR at temperatures between 300 to 800 C gave similar gas compositions and their patterns were reproducible. Gas chromatography-mass spectrography indicated these pyrolysis products as benzene, toluene, ethylbenzene, xylene, and styrene. The 100% dissolution of vulcanized rubber components could be made by orthodichlorobenzene using soxhlet extraction technique, while the dissolutions achieved by benzene, acetone, dimethyl formamide, and methylisobutyl ketone were 22%, 21%, 23%, and 21% respectively. Therefore the technique is applicable to determine the SBR in atmospheric organic dusts whose origination is mainly attributable to the worn tire tread dusts.

56090 **APTIC NO. 73663**

California Univ., Berkeley, Environmental Instrumentation Group

INSTRUMENTATION FOR ENVIRONMENTAL MONITORING. BIOMEDICAL (SECOND UPDATE). *Rept. Lawrence Berkeley Lab - 1, Volume 4, 560p., Jan. 1975. 569 refs. (The second update includes material from the first edition, processed as APTIC No. 62047.)*

Instrumentation for the monitoring of various environmental contaminants in air, water, and biological matrices (plants, animals, humans, and food) is reviewed. The instrumentation covers such pollutants as sulfur dioxide, nitrogen oxides, oxidants, carbon monoxide, hydrogen sulfide, hydrocarbons (including halogenated hydrocarbons), metals such as mercury, beryllium, cadmium, and lead, pesticides, halides, cyanides, particulates, nitrogen, phosphorus, asbestos and sulfur compounds. Analytical techniques specifically reviewed include X-ray diffraction, staining techniques (pathological), spectrophotometric methods, neutron activation analysis, spectrometric methods, fluorescence, electrochemical methods, chromatographic methods, colorimetry, and photometry. Equipment operating parameters, applications, and costs are provided. The biological effects of the above types of pollutants are also reviewed.

56091 **APTIC NO. 79926**

DETERMINATION METHOD OF WORKING ENVIRONMENT AND VARIOUS MEASURING DEVICES. *(Sagyo kankyo sokuteiho to sokuteiki no iroiro). Text in Japanese. Seifuti Daijesuto (Safety Dig.), 21(7):301-316, July 1975.*

Existing laws and ordinances concerning labor safety hygienics and working environment evaluation are reviewed with lists of the facilities covered by these laws. Descriptions of measurement devices used for the determination of working environmental conditions are given, including dust meters (high volume air samplers, individual dust samplers, digital dust meters, and direct gravimetric dust meters); thermometers and hygrometers; sound level meters; measurement equipment for mine pits and office environments electrolytic radiation meters, measurement equipment for more than 28 types of designated chemical compounds, measurement equipment fo lead compounds, oxygen concentration analyzers, and organic solvent and gas detectors.

56092 **APTIC NO. 80420**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

METHANOL IN AIR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 39-40, June 1975. 2 refs.*

NTIS: SAND75-0014

A colorimetric method for the determination of methanol in air is described. Air samples are collected in two midget impingers in series, with distilled water being used as the collecting medium. The methanol is then oxidized to formaldehyde, and the formaldehyde is reacted with a modified Schiff s reagent to yield a violet color which is read at 580 nm. An air concentration of 10 ppm methanol can be determined for a 1-cubic-foot air sample. Formaldehyde is the main interference.

56093 **APTIC NO. 80421**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

LEAD IN AIR, URINE, AND ON SWIPES. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 35-37, June 1975. 2 refs.*

NTIS: SAND75-0014

A colorimetric method for the determination of lead in air, urine, or on swipes is described. Air samples are collected on filter paper and are oxidized with concentrated nitric acid. hydrogen peroxide, and heat. Interfering elements are complexed with ammonium citrate and potassium cyanide. A lead dithizone complex is extracted from alkaline solution into chloroform, and the absorbance is measured colorimetrically at a wavelength of 510 nm. Stannous tin, bismuth, cadmium, and thallium are the main interferences. (Author abstract modified)

56094 **APTIC NO. 80422**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

FORMALDEHYDE IN AIR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 31-32, June 1975. 1 ref.*

NTIS: SAND75-0014

A colorimetric method for the determination of formaldehyde in air is presented. At least 1 cu ft of air is collected in a midget bubbler using aldehyde-free water as the collecting medium. The formaldehyde is then reacted with a modified Schiff s reagent to form a stable purple-colored complex which can be measured colorimetrically at 560 nm. The amount of formaldehyde present in the sample is determined from a standard curve of absorbance versus concentration.

56095 **APTIC NO. 80423**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

FLUORIDES AND HYDROGEN FLUORIDE IN AIR AND WATER. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 23-25, June 1975. 2 refs.*

NTIS: SAND75-0014

A colorimetric method for the determination of fluorides and hydrogen fluoride in air and water is described. The method is based on the reaction between fluoride and a zirconium-dye lake. The color of the dye lake becomes progressively lighter as the amount of fluoride increases and can be measured at 570 nm. Interfering ions include: aluminum, chloride, iron, hexametaphosphate, phosphate, sulfate, and alkalinity as calcium carbonate. It is necessary to distill the water sample to remove most interferences. Since the interferences are neither linear nor additive, mathematical compensation can not be employed for corrections. The temperature of the samples and standards must be the same to obtain correct results.

56096 **APTIC NO. 80424**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

CYANIDES AND HYDROCYANIC ACID IN AIR AND WATER. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 19-21, June 1975. 2 refs.*

NTIS: SAND75-0014

A colorimetric method for the determination of cyanides and hydrocyanic acid in air and water is described. Cyanide is neutralized and converted to cyanogen chloride by reaction with chloramine-T. This reacts with pyridine-pyrazolone reagent to form a blue color which can be read at 630 nm. The sensitivity and precision of the method can be improved by extracting the aqueous solution with n-butyl alcohol and then reading the absorbance at 630 nm. The effective range and sensitivity for aqueous color readings are 1-5 micrograms and 0.5 microgram, respectively; for the extracted color, the range and sensitivity are 0.2-2.0 micrograms and 0.1 microgram, respectively. The salt content of the sample and standards must be the same to obtain colors of comparable intensity. Thiocyanates and cyanogen give the same reaction as cyanides. (Author abstract modified)

56097 **APTIC NO. 80425**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

CHRONIC ACID MIST IN AIR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 17-18, June 1975. 2 refs.*

NTIS: SAND75-0014

A colorimetric method for the determination of chronic acid mist in air is described. The method is based on the fact that chromates react with sym-diphenylcarbazide in acid solution to produce a pink-violet color at a wavelength of 540 nm in keeping with Beer s law. The range of the method is from 0.2-10 micrograms of hexavalent chromium. A calibration curve is drawn by plotting the amount of chromium (micrograms) against the absorbance of the standard. Iron, copper, nickel, and vanadium are the main interferences. (Author abstract modified)

56098 **APTIC NO. 80426**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

CHLORINE IN AIR, WATER, AND WASTEWATER. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 15-16, June 1975. 2 refs.*

NTIS: SAND75-0014

A rapid colorimetric method for the determination of total available chlorine in air, water, or wastewater is described. A yellow color is developed when ortho-tolidine is reacted with chlorine in acid solution. The absorption maxima occur at 410 and 438 nm at a pH of 1.6. The measuring range of the method is 0-1 ppm, though higher concentrations can be analyzed by diluting the sample. Iron, manganese, and nitrite interfere even in small quantities. (Author abstract modified)

56099 **APTIC NO. 80427**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

ARSENIC IN AIR, URINE, AND WATER. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 11-13, June 1975. 1 ref.*

NTIS: SAND75-0014

A colorimetric method for the determination of arsenic in air, urine, or water is presented. Ashed samples are reduced to trivalent arsenic, and are then evolved as arsine gas. The latter is collected in silver diethyldithiocarbamate which is then determined colorimetrically at 560 nm. A calibration curve of absorbance versus micrograms of arsenic is drawn and used to determine the arsenic content of the samples. Airborne samples are reported as mg of arsenic/cu m of air sampled or as micrograms of arsenic/l of air sampled. (Author abstract modified)

56100 **APTIC NO. 80434**

Dasibi Corp., Glendale, Calif.

CALIBRATION OF DASIBI MODEL 1003AH OZONE MONITOR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept., Atomic Energy Commission Contract AT (29-1)-789, p. 171, June 1975.*

NTIS: SAND75-0014

Steps for calibrating the Dasibi Model 1003AH Ozone Monitor are outlined. The monitor continuously measures airborne ozone concentrations at the ppm level. Direct digital readout is displayed on the front panel of the monitor. The calibration procedure includes details on warmup period, number display verification, and standard preparation.

56101 **APTIC NO. 80435**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

CALIBRATION OF OZONE METERS (TITRATION METHOD). *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, P. 173-175, June 1975. 2 refs.*

NTIS: SAND75-0014

A titration procedure for calibrating ozone meters is presented. Ozone is absorbed in potassium iodide and the iodine released is titrated with standard sodium thiosulfate. The apparatus includes: a midget bubbler, an ozone generator, a mixing flask, two air metering devices, and collecting bags (1.5 liter capacity). The thiosulfate is standardized as follows: dissolve 5 g of potassium iodide and 4 g of sodium bicarbonate in 300 ml of water; add slowly 1:1 hydrogen chloride until no more carbon dioxide is released; then add 10 ml of excess 1:1 HCl; add 35 ml of 0.1 N potassium chromate and mix thoroughly; add stirring bar and place on a magnetic stirrer; titrate with thiosulfate to a light yellow while stirring; add 1 ml starch indicator; and titrate until the blue is replaced by the pale color of chromium chloride.

56102 **APTIC NO. 80436**

Bacharach Instrument Co., Pittsburgh, Pa.

CALIBRATION OF J-W MERCURY VAPOR SNIFFER. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept., Atomic Energy Commission Contract AT (29-1)-789, p. 169, June 1975.*

NTIS: SAND75-0014

Steps for calibrating the J-W Mercury Vapor Sniffer are outlined. The Sniffer is a dual-range portable instrument for the detection and measurement of mercury vapor. The indicating meter is calibrated in the 0-1.0 mg/cu m and 0-0.2 mg/cu m ranges. The calibration procedure includes details on zero adjust, warmup period, sample preparation, and calibration curve preparation.

56103 **APTIC NO. 80437**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

ORGANIC SOLVENTS IN AIR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 137-141, June 1975. 1 ref.*

NTIS: SAND75-0014

A gas chromatographic method for the identification of organic solvents in air is described. A known volume of air is drawn through a charcoal tube to trap the organic vapors present. The charcoal is transferred to a graduated cylinder and desorbed with carbon disulfide. An aliquot is then injected into a gas chromatograph, and the area of the resulting peak is determined and compared with areas obtained for the injection of standards. The precision of the analytical method is + or - 7%. Any compound which possesses the same retention time as the specific compound under study at the operating conditions used is an interference. Most interferences can be eliminated by altering chromatographic conditions. A disadvantage of the method is that the amount of sample which can be taken is limited by the number of milligrams that the tube will hold before overloading. When two or more solvents are known or suspected to be present in the air sample, this information as well as their suspected identities should be transmitted with the sample since one compound may displace the other from the charcoal due to differences in polarity. (Author abstract modified)

56104 **APTIC NO. 80438**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

OIL MIST IN AIR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 135-136, June 1975. 2 refs.*

NTIS: SAND75-0014

A spectrophotometric method for the determination of oil mist in air is described. Air samples are collected on Whatman No. 41 filter paper, 37-millimeter membrane filters, electrostatic precipitator collectors, or by suitable organic solvents. The oil mist is then extracted or washed into an organic solvent. Spectra are run at the particular wavelength at which the oil shows maximum absorbance using either fluorescence, infrared, or ultraviolet spectrophotometry. The amount of oil is quantitated using the standards for the particular oil by measuring the peak height and plotting this value versus concentration in micrograms/ml. (Author abstract modified)

56105 **APTIC NO. 80439**

Gastech, Inc., Mountain View, Calif., Johnson Instrument Div.

CALIBRATION OF GASTECH HALIDE DETECTOR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept. Atomic Energy Commission Contract AT (29-1)-789, p. 179-180, June 1975.*

NTIS: SAND75-0014

Steps for calibrating the Gastech halide detector are outlined. The detector is a portable instrument for the detection and measurement of all airborne halogen compounds. The calibration steps include: zero centering, warm-up requirements, sample preparation, and calibration curve preparation based on two or three different gas or vapor conventrations.

56106 **APTIC NO. 80440**

S ott tion-Davis Instruments, Charlottesville, Va.

CALIBRATION OF DAVIS HALIDE INTRUMENT. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Sandia Labs., Albuq er e Mex., Environmental Health Dept., Atomic Energy Commission Contract AT (29-1)-789, p. 177, June 1975.*

NTIS: SAND75-0014

Steps for calibrating the Davis Halide Meter are outlined. The instrument is used for field detection and measurement of halogenated hydrocarbons in the 0-500 ppm range. The calibration procedure includes details on warmup period, zero adjust, standard sample preparation, and calibration curve preparation.

56107 **APTIC NO. 80441**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

CARBON MONOXIDE IN AIR AND COMPRESSED AIR TANKS. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 127-129, June 1975. 1 ref.*

NTIS: SAND75-0014

A spectrophotometric method for the determination of carbon monoxide in air or in compressed air tanks is described. Air samples are obtained in a 5-liter or larger inert plastic bag and are analyzed by infrared spectrophotometry in the 2- to 14-micron range using a long-path gas cell. The analytical range extends from 10-500 ppm or higher. Any gas that absorbs infrared radiation at the analytical wavelength acts as an interference; however, by scanning the complete infrared spectrum, such interferences can usually be detected as having additional absorption lines. Water vapor is removed by the use of drying agents on the inlet of the infrared cell. (Author abstract modified)

56108 **APTIC NO. 80442**

Sandia Labs., Aluquerque, N. Mex., Environmental Health Dept.

BERYLLIUM IN AIR SAMPLES AND SWIPES (SPECTROGRAPHIC METHODS). *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 119-121, June 1975. 1 ref.*

NTIS: SAND75-0014

A spectrographic method for the determination of beryllium in air samples and swipes is described. The sample is wet-ashed in a digestion mixture of sulfuric, perchloric, and nitric acid; a known amount of molybdenum is added as an internal standard, and the sample is diluted to a known volume. Aliquots of the samples and standard solutions, containing molybdenum are transferred to hollow-cup electrodes. The electrodes are arced in a 10-ampere, direct current arc; and the beryllium lines are measured on a densitometer. The beryllium concentration is calculated from a standard curve. The sensitivity of the method is 0.1 microgram of beryllium total sample. Accuracy is + or - 20% between 0.1 and 1.0 microgram and + or - 10% between 1.0 and 3000 micrograms. (Author abstract modified)

56109 **APTIC NO. 80603**

Sandia Labs., Albuquerque, N. Mex., Environmnetal Health Dept.

SILICA IN AIR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT(29-1)-789, p. 49-52, June 1975. 1 ref.*

NTIS: SAND75-0014

A colorimetric method for the determination of silica in air is described. The sample is digested in phosphoric acid to remove silicates and is then dissolved in hydrofluoric acid. The silica content is determined colorimetrically either as the silicomolybdate at 420 nm or as molybdenum flue at 820 nm. Concentrations from 5-140 micrograms can be detected in the molybdenum-blue range and from 0.1-2.5 mg in the silicomolybdate range. Sulfides, phosphate, and large amounts of iron interfere and cause low results.

56110 **APTIC NO. 80605**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

SULFUR DIOXIDE IN AIR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 57-59, June 1975. 2 refs.*

NTIS: SAND75-0014

A colorimetric method for the determination of sulfur dioxide in air is described. Sulfur dioxide is absorbed in a solution of potassium tetrachloromercurate. Caution must be exercised since the latter reagent is extremely poisonous. The complex formed is then reacted with pararosaniline and formaldehyde and determined colorimetrically at 548 nm. The lower limit of detection is 0.01 ppm of SO2 in a 30-liter air sample. The analytical range is 0.2-35 micrograms in 25 ml of final solution. Interferences such as oxides of nitrogen are destroyed by adding sulfamic acid, and ozone is destroyed by allowing a time lapse of 20-30 min from sampling to the start of the analysis. Heavy metals are complexed by the addition of ethylenediaminetetraacetic acid. (Author abstract modified)

56111 **APTIC NO. 80606**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

OZONE IN AIR (COLORIMETRIC METHOD). *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 47-48, June 1975. 1 ref.*

NTIS: SAND75-0014

A rapid colorimetric method for the determination of ozone in air is described. The air sample is drawn through a midget impinger containing 10 ml of neutral potassium iodide solution. The ozone liberates iodine which is determined colorimetrically at 352 nm. The analytical range of the method extends from 0.01-10 ppm, and the method s sensitivity depends on the volume of air sampled. The analysis must be completed within 1 hr after sampling. Reducing compounds such as sulfur dioxide and hydrogen sulfide and oxidants such as halogens and hydrogen peroxide are the main interferences. (Author abstract modified)

56112 **APTIC NO. 80607**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

OZONE IN AIR (TITRATION METHOD). *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 45-46, June 1975. 1 ref.*

NTIS: SAND75-0014

A rapid volumetric method for the determination of ozone in air is described. Ozone is collected in potassium iodide solution, and the iodine liberated is titrated with sodium thiosulfate using starch as an indicator. The sensitivity of the method depends on the volume of air sampled. The main limitation of the method is that the liberated iodine is very sensitive to reducing vapors or dusts such as sulfur dioxide or hydrogen sulfide. Strong oxidants such as halogens and peroxides will liberate iodine. Advantages of the method include simplicity and the lack of expensive equipment.

56113 **APTIC NO. 80608**

Sandia Labs., Albuquerque, N. Mex., Environmental Health Dept.

NITROGEN DIOXIDE IN AIR. *In: Manual of Analytical Methods for the Environmental Health Laboratory. Atomic Energy Commission Contract AT (29-1)-789, p. 41-43, June 1975. 1 ref.*

NTIS: SAND75-0014

A colorimetric method for the determination of nitrogen dioxide in air is described. Nitrogen dioxide is collected in sulfanilic acid, and the diazotized NO2 is coupled with N-(1-naphthyl)-ethylenediamine to form an azo dye. The color of the dye is read at a wavelength of 550 nm. The analytical range of the method is 0.005-5 ppm by volume or 0.01-10 micrograms/l when sampling with fritted bubblers. Strong oxidizing and reducing agents such as sulfur dioxide and peroxyacylnitrate are the main interferences. (Author abstract modified)

1974

56114 **APTIC NO. 80389**

Becker, James H. and John N. Driscoll

STATIONARY SOURCE MONITORING. I. NON-METHANE HYDROCARBONS. *Am. Lab., p. 31-37, Dec. 1974. 7 refs.*

Instruments for measuring nonmethane hydrocarbons were evaluated including a selective combustor coupled to a flame ionization analyzer and a commercially available process gas chromatograph. The applicability of the instruments was tested with emissions from an incinerator, refinery, and a gray iron foundry. The selective combustor-flame ionization detector technique with modifications is a reasonable method for monitoring nonmethane hydrocarbons in stationary sources. Methane is a significant portion of the total hydrocarbons emitted from the incinerator, gray iron foundry, and catalytic cracking unit at the refinery. The process gas chromatograph with modifications can be used to monitor high concentrations of both total hydrocarbons and methane but not in sources where the levels change rapidly. (Author conclusions modified)

56115 **APTIC NO. 80959**

Beran, D. W. and F. F. Hall, Jr.

REMOTE SENSING FOR AIR POLLUTION METEOROLOGY. *Bull. Am. Meteorol. Soc., 55(9):1097-1105, Sept. 1974. 33 refs.*

The application of ground based remote sensing systems for monitoring meteorological parameters of importance in urban air pollution is discussed. Typical system considerations include an analysis of site characteristics and sensor location. Sensors of temperature profiles or static stability include microwave radiometry, laser temperature measurements, and acoustic echo sounding. Wind measurements can be made with lasers or radar; an acoustic sounder may also be used. Laser backscattering techniques, an acoustic echo sounder, or FM/CW radar can be used to measure the depth of mixed layers. Scanning a considerable area around the station within defined horizontal ranges and altitudes is highly dependent upon angular resolution capabilities of the remote sensing device and its provision for a high rejection of unwanted returns in directions removed from the narrow probing main beam of waves. Operation in this mode is discussed for laser methods and radar probing. (Author abstract modified)

56116 **APTIC NO. 73633**

Bourbon, P.

DETERMINATION OF SULFUR DIOXIDE ON DRY ABSORBENT. APPLICATION TO POLLUTED ATMOSPHERES. *(Contribution a la determination du dioxyde de soufre sur absorbant sec: application aux atmospheres polluees). Text in French. Tribune CEREDEAU (Centre Belge Etude Doc. Eaux), 27(366):255-259, 1974. 6 refs.*

A method for the determination of sulfur dioxide by sampling on dry adsorbent is described. Air is sampled through a cellulose filter previously impregnated with glycerinated zinc acetate. The SO2 adsorbed is subsequently determined by a colorimetric method, using pyridine nitroprusside reagent. A comparison with the strong acidity method showed that the latter method usually gives higher readings, especially in urban atmosphere.

56117 **APTIC NO. 73634**

Bourbon, P., F. Klein, J. Alary, J. Esclassan, and J. C. Lepert

INTERFERENCE OF HYDROCYANIC ACID IN THE DETERMINATION OF NITROGEN OXIDES BY CHEMILUMINESCENCE. *(Interference de l acide cyanhydrique sur le dosage de (NO)x par chimie luminescence). Text in French. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), 27(366):250-254, 1974.*

The interference of hydrocyanic acid, as present in flue gases generated during ammonia incineration, in the chemiluminescent determination of nitrogen oxides was studied under different conditions. Hydrocyanic acid caused an increase in the nitrogen dioxide readings without influencing the nitric oxide readings when pure nitrogen was used as a carrier gas. In the presence of 2-20% oxygen, the rate of conversion of hydrocyanic acid, originally present in concentrations between 1 and 300 ppm, into nitrogen dioxide was 30% in a non-conditioned converter, and 80% in a converter conditioned with compressed air. Total conversion of hydrocyanic acid was observed at 650 C. The imcomplete conversion into nitrogen oxides may be due to the formation of small quantities of carbon monoxide in the presence of oxygen, and to the partial reduction of nitric oxide by CO.

56118 **APTIC NO. 73552**

Bromberg, Steven M., Gerald G. Akland, and Berne I. Bennett

SURVEY OF LABORATORY PERFORMANCE. ANALYSIS OF SIMULATED AMBIENT SULFUR DIOXIDE BUBBLER SAMPLES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Methods Standardization and Performance Evaluation Branch, 22p., Dec. 1974. 8 refs.*

A performance survey among 112 laboratories to assess the quality of 24-hour bubbler data for sulfur dioxide was conducted. The test materials simulated ambient concentrations of SO2 ranging from just above the detectable limit of the reference method to approximately 400 micrograms/cu m. Any analytical method in routine use by the participating laboratories was allowed for the determination of SO2 samples in five concentration ranges. The percentages off misses among all laboratories for the five concentration ranges were 29%, 21%, 13%, and 19%; thus there was no apparent relationship between concentration and the ability of a laboratory to analyze correctly. Approximately 10% of the laboratories accounted for 50% of a total of 107 misses. All samples were analyzed acceptably by 51% of the laboratories. About 80% of the laboratories correctly analyzed at least four of five samples. More than 50% of the laboratories analyzed each of the five intervals within + or - 10%, and over 80% analyzed the five intervals within + or - 30%.

56119

APTIC NO. 80967

Burns, D. Thorburn, J. S. Coy, W. P. Hayes and D. M. Kent

THE INDIRECT SPECTROPHOTOMETRIC DETERMINATION OF SULPHATE WITH 2-AMINOPERIMIDINE HYDROCHLORIDE. *Mikrochim. Acta, vol. 1974: 245-248, 1974. 9 refs.*

A method is described for the indirect determination of sulfate ions in aqueous solutions after precipitation of 2 aminoperimidine sulfate. Beer s law is obeyed over the range 0 to 30 ppm. Interferences were investigated. The application of the method to rainwater is discussed. (Author abstract)

56120

APTIC NO. 80965

Calo, J. M. and A. D. Bailey

PHASE-SENSITIVE PULSE COUNTING IN MODULATED BEAM MASS SPECTROMETRY. *Rev. Sci. Instr., 45(11):1325-1330, Nov. 1974. 17 refs.*

A phase-sensitive pulse counting method, which shows considerable promise as a signal processing technique for modulated beam mass spectrometry, is presented. This method allows near simultaneous monitoring of mass peaks of interest by fast mass spectrometer scanning, while retaining the advantages of phase sensitive detection. The electronic system and the molecular beam apparatus are described, and mass spectrometric results for supersonic water vapor beams, obtained using the system, are discussed. (Author abstract)

56121

APTIC NO. 73641

Chatfield, E. J.

QUANTITATIVE ANALYSIS OF ASBESTOS MINERALS IN AIR AND WATER. *Electron Microscopy Society of America, Ithaca, N. Y., Proc. Electron Microsc. Soc. Am., 32nd Annu., St. Louis, Mo., 1974, 2p. 4 refs.*

An analytical technique for the electron microscopic detection and measurement of low concentrations of asbestiform minerals in air and water samples is described. About 5 cu m of the airborne asbestos is collected on a 0.1 micron pore size membrane filter which is then ashed in a clean glass vial using a plasma microincineration technique. The residue is gently redispersed ultrasonically in filtered distilied water, and the suspension is centrifuged onto a 1 cm diameter glass cover disc. The disc is dried, and a thin carbon coating is applied by evaporation. The carbon film is scored and floated off onto water, carrying the particles with it; pieces of this are then picked up on 200 mesh copper grids. A maximum of 10 grid squares is searched for asbestos particles at a magnification of about 25,000. Particles are identified by electron diffraction and are measured in both length and width by comparison with a series of geometrically spaced calibration circles scored on the fluorescent screen of the microscope. Particle counts are processed by a computer program which calculates the particle number and mass concentrations. The actual sensitivity of the method depends on the degree of concentration which can be achieved while retaining a suitable microscope specimen. Air concentrations down to about 0.01 fibers/cc can be measured. Typical crocidolite and amosite particles are illustrated for comparison.

56122

APTIC NO. 73544

Chuan, Raymond L.

PARTICULATE MASS MEASUREMENT BY PIEZOELECTRIC CRYSTAL. *Nat. Bur. Stand., U. S. Spec. Publ., no. 412:137-148, 1974. (Presented at the Aerosol Measurements Seminar, Gaithersburg, Md., 1974.)*

The measurement of particulate masses by an adhesive-coated quartz crystal is described. The crystal forms an impaction surface which captures particulates from decelerating jets; mass can be measured by frequency change to a sensitivity of 10 to the 9th power hz/cm. The scheme is applied to a number of working instruments which continuously and directly measure particulate mass concentration and distribution. Since the adhesive-coated crystal retains the impacted material, post-sampling analysis can be performed nondestructively and without disturbing the material by the use of scanning-electron microscope. (Author abstract modified)

56123

APTIC NO. 73656

Chuan, Raymond L.

APPLICATION OF AN OSCILLATING QUARTZ CRYSTAL TO MEASURE THE MASS OF SUSPENDED PARTICULATE MATTER. *In: Analytical Methods Applied to Air Pollution Measurements. Robert K. Stevens and William F. Herget (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974, Chapt. 9, p. 163-189. 1 ref.*

The use of an oscillating quartz crystal too measure the mass off suspended particulate matter is described. The quartz crystal microbalance particulate mass monitor is a piezoelectric device which senses the mass of particulate matter impacted aerodynamically on an adhesive-coated quartz crystal through a number of small jets and creates a decrease in the resonant frequency of the crystal. The basic sensitivity of this instrument is 10 to the 9th power Hz/g. It was used in both ambient air and source situations. Direct-connect automobile exhaust measurements of a car on a dynamometer indicate the average particulate emission/mi is 37.0 mg/mi. Emissions from a basic oxygen furnace vary considerably with the operating state of the furnace. For the first 1.5 min the particulate concentration is lowest at 1.2 mg/cu m. It increases to 75 mg/cu m and gradually settles down to 8 mg/cu m. The composition and concentration of the smoke plume from the coal fired power plant at Four Corners, N. Mex. were measured. Solid fuel rocket plume was measured and show a maximum concentration of 200 micrograms/cu m. The vertical distribution of particulates was determined over the Los Angeles Basin. Thee peak concentration at 6000 ft was over 300 micrograms/cu m.

56124

APTIC NO. 80630

Clark, R. L. and C. O. Ruud

TRANSMISSION ELECTRON MICROSCOPY STANDARDS FOR ASBESTOS. *Micron, vol. 5:83-88, 1974. 5 refs.*

Transmission electron micrographs and selected area electron diffraction patterns of all six recognized minerals (chrysotile, amosite, anthophyllite, crocidolite, tremolite, and actinolite) are illustrated. Each was produced with the same parameters using a Philips EM200 electron microscope. Identification was accomplished by comparing the electron micrographs and the characteristic diffraction patterns with standards previously recorded. A list of X-ray crystallographic and chemical data found in the literature for the six asbestos minerals is also provided.

56125

APTIC NO. 80794

Fischer, H., M. Neufelder, G. Kohl, and D. Pruggmayer

AN INSTRUMENT FOR THE CONTINUOUS DETERMINATION OF HALOGENS AND HYDROCARBONS. *(Kontinuierlich arbeitendes Kohlenwasserstoff- und Halogenmessgeraet). Text in German. GIT (Glas. Instrum. Tech.) Fachz. Lab., 18(3):214-219, March 1974. 3 refs.*

Increased demand for instruments for the continuous monitoring of the ambient air has led to the development of a reliable and highly sensitive measuring device which will continously and simultaneously determine the amounts of halogen compounds and hydrocarbons present. This instrument can measure sources of emission, concentrations at the place of work, and, in special cases, will determine the contamination by immission. The instrument differs from the majority of instruments in that the air sample, after traversing a short heated entrance probe, first passes over the detectors at less than atmospheric pressure and only then to the pump. This ensures correct readings especially where agressive substances are concerned or those that have a high boiling point or are easily decomposed. This also makes possible the testing of aerosols. The essential characteristics of this instrument are the reliable reproducibility of the halogen readings and the simultaneous determination of the hydrocarbons. (Author abstract)

56126 **APTIC NO. 80882**

Florkowski, Tadeuz and Stanislaw Piorek

ANALYSIS OF AIR PARTICULATES BY RADIOISOTOPE X-RAY FLUORESCENCE FIR AIR POLLUTION CONTROL. *Nukleonika, 19(10):891-898, 1974. 4 refs.*

An X-ray fluorescence method for the elemental analysis of airborne particulates is described. Air samples are collected on Whatman 41 filter paper at pumping volumes of 10-400 cu m. Radioisotope sources of excitation include: americium-241, cadmium-109, and iron-55, and plutonium-238. The analysis is performed with the use of a silicon/lithium detector coupled with appropriate amplifiers and a multichannel analyzer. Analytical data are presented for determinations of lead, zinc, and iron in particulates sampled from urban areas.

56127 **APTIC NO. 73232**

Fujii, T.

THE DETERMINATION OF PERMANENT GASES, NITROGEN OXIDE, SULFUR COMPOUNDS AND WATER BY GC (PART 2) PROGRAMMED SINGLE COLUMN FROM LOW TEMP. *(GC ni yoru eikyu gasu, chisso sanka butsu, iou kagobutsu, mizu no doji bunseki ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):202, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 59.)*

Optimum measurement conditions were determined for the simultaneous determination of multi-component gases by gas chromatography. The causes of ghost peak and its elimination in the case of the program temperature method using sorption column were investigated. Using stainless steel, teflon, and glass columns, helium as carrier gas, and PoraPak Q, QS, Carbosieve B, SE 30/chromosorb, MS5A and glass beads as sorbents samples consisting of nitrogen, oxygen, carbon dioxide, nitric oxide, nitrous oxide, water, and sulfur dioxide were analyzed in the temperature ranges of 60 C to 160 C and -50 C to 220 C. In the case of the teflon column, the base line was shifted, due to the porosity and thermal change of teflon, while tailing was marked in the stainless steel column. Possible causes for ghost peaks are impurities in carrier gas and sorbent, pressure variation, and contamination of the system. In this case, however, the effect of impurities in carrier gas, particularly moisture, was marked. By the use of an MS trap, the base line was stabilized and a clear chromatogram was obtained.

56128 **APTIC NO. 73385**

Hirano Koichiro and Katsunori Honma

CALIBRATION OF DIGITAL DUST INDICATOR WITH MONO-DISPERSED LEAD FUME. *(Tanbunsan na ari hyumu ni yoru dejitaru funginkei no kosei (Dai I ho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):246, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974. Paper 106.)*

Lead fume generated by an ultrasonic wave aerosol generator was used to calibrate a digital dust indicator. Lead chip was placed in an ultrasonic wave furnace and heated to 800 to 1200 C. The diluted lead fume is divided into two streams by a carrier gas, one for a digital dust indicator being calibrated, and one for a standard dust indicator with silver membrane filter trap. The amounts of trapped lead were determined by the filter weight difference before and after the trap, or by atomic absorption spectrometry. The furnace temperature has a linear relationship with both particle size and fume concentration generated by the ultrasonic wave generator. The particle sizes generated were 0.05 to 0.5 micron at furnace temperature 800 - 1200 C. Therefore, the lead fume can be used to calibrate digital dust indicators. This calibration technique is better than the technique using stearic acid aerosol, because of the much greater specific gravity of lead; 13 times larger than that of stearic acid, thus achieving more effective and accurate fume trapping. When the relative response of the dust indicator based on stearic acid is desired, the factor of thirteen can be used to convert the relative response obtained with lead, because the weight concentration of a particle is direct proportional to its specific gravity.

56129 **APTIC NO. 73573**

Jannson, Anders and Peringe Grennfelt

DETERMINATION OF MASS OF FILTER-COLLECTED AIR-BORNE PARTICLES BY MEASURING ABSORPTION OF BETA RADIATION. *Swedish Water and Air Pollution Research Lab., Gothenburg (Sweden), Rept. B 193, 20p., May 1974. 7 refs.*

Beta-radiation absorption measurements for the determination of the total mass of filter-collected airborne particulates was investigated for small surface densities. Various types of test dust and atmospheric dust were examined, and all showed a dependence between beta absorption and surface density of the particles on the filters that differed from an exponential curve obtained while using thin foils. Absorption was a linear function of the surface density for particles smaller than 10 micron at surface densities lower than 1 mg/sq cm. Two alternatives were found for measurements of airborne particulate concentration: measurement of surface densities larger than 2 mg/sq cm or measurement of surface densities lower than 1 mg/sq cm. High surface densities resulted in an exponential absorption, while the low surface densities resulted in linear absorption. The latter reflected variations in particle size distribution, density, and shape. The beta-absorption method showed a standard deviation of about 13 micrograms/sq cm. The lowest allowable amount of particles collected on the filter was set to 50 micrograms/sq cm. Particulate concentrations down to about 10 micrograms/cu cm can be measured with a filtration area of 1.54 sq cm and a sample volume of 8 cu m. (Author abstract modified)

56130 **APTIC NO. 73517**

Jasinski, Raymond, Gabriel Barna, and Isaac Trachtenberg

STUDIES OF A NITROGEN DIOXIDE SENSITIVE, CHALCOGENIDE GLASS ELECTRODE. *J. Electrochem Soc., 121(12):1575-1578, Dec. 1974. 8 refs. (Presented at the Electrochemical Society Meeting, San Francisco, Calif., May 12-17, 1974, Paper 358.)*

The sensitivity of an activated chalcogenide glass electrode in an aqueous electrolyte to airborne nitrogen dioxide is discussed. The potentiometric response of the glass electrode to NO2 in air and in nitrogen over the concentration range of 1-392 ppm yields a potential-log concentration dependence, with the electrode response being reversible. Although the upper operating limit of NO2 concentration is not precisely known, concentrations of around 10% appear to be detrimental. The absence of electrode response to nitric oxide, nitrite, nitrate, hydrogen ion, oxygen, carbon monoxide, and sulfur dioxide rules out sensing mechanisms based on redox couples involving these species and implies a specific reaction between the glass and NO2, with the glass itself serving as the reduced half of the couple.

56131 **APTIC NO. 73244**

Kano, Gen and Kazuo Tsuruhashi

DEVELOPMENT OF PIEZOELECTRIC VIBRATION TYPE GRAVIMETRIC DENSITOMETER FOR MEASUREMENT OF SUSPENDING DUST. *(Atsuden kesshoho ni yoru fuyu fungin juryonodokei no shisakuki tsuite). Text in Japanese. Preprint, Japan Society of Automatic Control, Kyoto, p. 521-522, 1974. (Presented at the Japan Soc. of Automatic Control, 17th Lecture Meeting, Kyoto, Japan, Nov. 21- 23, 1974.)*

The instrument described is composed of an impactor and a precipitator as the two major parts. Aerosols are introduced into the impactor where particles larger than 10 micron collide with a collision plate. Aerosols smaller than 10 micron are led to the precipitator where they pass through a corona discharging electrode into a strong corona region. The aerosols are charged by corona discharge and collected on a crystal sensor. Test results showed that about 95% of particles smaller than 10 micron were collected while 3-4% remained in various parts of the machine. With submicron particles, the precipitation efficiency was almost independent of corona current intensity between 2-6 microamperes.

56132 **APTIC NO. 80638**

Lavery, Donald S. and Paul A. Wilks, Jr.

VINYL CHLORIDE ANALYSIS BY INFRARED SPECTROSCOPIC METHODS. *Am. Lab., 1974:1-5, Oct. 1974.*

The use of infrared analyzers equipped with long path cells for the monitoring of vinyl chloride is reviewed. The employment of a 20-meter folded path absorption cell provides the necessary sensitivity for reliable readings down to the 1 ppm level. A high velocity pump can be mounted near the cell to sweep it out at least 5 times/min, providing continuous and nearly instantaneous readings of vinyl chloride concentration. Sampling hoses can be attached to portable units to allow the operator to make concentration measurements at any selected location. For fixed installations, a 12-point sampling manifold can be used to monitor areas as much as 500 ft from the analyzer once every 12 min for each point. Continuous monitors are usually set at 0-50 ppm full scale, although scales as low as 0-10 ppm are possible. A double beam infrared spectrum of vinyl chloride is shown, illustrating the four strongest absorption bands at 6.15, 9.8, 10.9, and 13.9 micron.

56133 **APTIC NO. 73613**

Margeson, John H. and Robert G. Fuerst

EVALUATION OF A CONTINUOUS COLORIMETRIC METHOD FOR MEASUREMENT OF NITROGEN DIOXIDE IN AMBIENT AIR. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Quality Assurance and Environmental Monitoring Lab., 51p., Oct. 1974. 22 refs.*

A continuous colorimetric procedure for the measurement of nitrogen dioxide in ambient air was evaluated, using two different azo-dye-forming absorbing solutions in a Technicon instrument to test the reliability of calibration techniques. Static calibration was unrealiable, and dynamic calibrating using a reliable NO2-generation system was required. Ozone was a significant negative interferent. The response time of the continuous colorimetric method was 15 min with the technicon IV analyzer for 97% of full color development as compared to 3 min for manual analyses using both modified Saltzman and Lyskhow absorbing solutions. (Author abstract modified)

56134 **APTIC NO. 73349**

Mori, M., H. Morita, and Y. Okabe

ON THE HF GAS MONITOR BY FLUORIDE ELECTRODE. *(Ion denkyoku-ho ni yoru haigasu-chu HF sokutei no tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):437, Nov. 1974. (Presented at the National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 288.)*

A hydrogen fluoride monitor having a glass absorption chamber in which absorbent was sprayed into the sample gas is described. A pH buffer for fluoride determination was supplied as an absorbent at 1 ml/min, and a sample gas containing HF was introduced at a flow rate of 4 l/min. The resulting absorbent was pumped to a detector cell, and the fluoride concentration was determined by the fluoride ion electrode method. Results obtained from five samples of the same type were compared to those obtained by chemical and lathanum-alizarin complexone (JIS K 0105) methods, and correlation coefficients of 0.994-0.996 were obtained. The monitor was usable in the ranges of 0-5 ppm and 0-2 ppm, and the standard deviation was about + or - 3%.

56135 **APTIC NO. 73534**

Moskowitz, Howard R., Andrew Dravnieks, and Clifford Gerbers

ODOR INTENSITY AND PLEASANTNESS OF BUTANOL. *J. Exp. Psychol., 103(2):216-223, 1974. 15 refs.*

The odor intensity and pleasantness (or unpleasantness) of normal-butanol, recommended by the American Society of Testing and Materials as a possible odor reference compound, were scaled by 33 subjects. Odor pleasantness decreased with increasing concentration at about the same rate that intensity increased with increasing concentration, though the inverse relation held only for group data and not for individual functions. The pleasantness functions were also subject to severe curvature in contrast to the intensity functions. The average threshold for butanol was about 62 ppm, and a concentration of 300 ppm was hedonically neutral. (Author abstract modified)

56136 **APTIC NO. 73292**

Nagayama, Tsutae, Hiroyuki Matsuda, and Kazuo Koyata

AUTOMATION OF FLUORESCENT PARTICLE METHOD FOR EXHAUST GAS CONCENTRATION MEASUREMENTS: AUTOMATIC SAMPLING AND COUNTING METHODS FOR FLUORESCENT PARTICLES. *(Keiko ryushiho ni yoru haigasu senbetsu sokutei no jido sosa: Keiko ryushi no jido saishu keisuho). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Dai-ichi Kenkyusho Hokoku (Tech. Lab. Central Research Inst. (No. 1) Electric Power Ind., Rept.), no. 73105:1-16, Aug. 1974.*

Studies were made of automatic sampling and counting methods for fluorescent particles in order to improve the accuracy of particle count and the efficiency of exhaust gas concentration determinations. Automatic measurement of particle size was also investigated. Fluorescent test materials used in this investigation included green-emitting fluorescent particles (mixture of zinc, sulfur, and copper); brown-emitting fluorescent particles (mixture of Zn, S, and manganese); H-type revolving rod; yellow and green blackboard chalk; detergents; anthracene; and soil and sand. Afterglow characteristics of the test materials were measured, and were suitable for taking counting and particle size measurements automatically. Afterglow from fluorescent tracer particles lasts longer than 4 m sec, when afterglow from other materials is gone. Experimental measurements also showed that for certain particle sizes (3-40 microns) of green-emitting fluorescent particles, the amount of fluorescence varied as the second power of particle diameters.

56137 **APTIC NO. 75948**

Nichols, Grady B.

TECHNIQUES FOR MEASURING FLY ASH RESISTIVITY (FINAL REPORT). *Southern Research Inst., Birmingham, Ala., Environmental Protection Agency Contract 68-02-1303, Program Element 1AB012, Rept. EPA-650/2-74-079, 49p., Aug. 1974. 9 refs.*

NTIS: PB 244140/AS

The methods used for the measurement of the electrical resistivity of particulate matter suspended in an effluent gas stream are discussed. The behavior of an electrostatic precipitator is related to the value of the resistivity of the suspended particulate. Some of the mechanisms of electrical conduction in fly ash from coal combustion are described as they influence resistivity. A discussion is also included of in situ versus laboratory techniques for measuring resistivity and the interpretation of data measured by these methods. The point to plane probe provides data that are more clearly consistent with observed behavior of operating electrostatic precipitators than the other alternative devices. This factor, together with the similarities between the operation of a precipitator and the instrument are the basis for the selection of the point to plane device as the preferred measurement instrument. (Author abstract modified)

56138 **APTIC NO. 80788**

Rattonetti, Anthony

DETERMINATION OF SOLUBLE CADMIUM, LEAD, SILVER, AND INDIUM IN RAINWATER AND STREAM WATER WITH THE USE OF FLAMELESS ATOMIC ABSORPTION. *Anal. Chem., 46(6):739-742, May 1974. 12 refs.*

Interference was found in the direct determination by flameless atomic absorption of environmentally hazardous cadmium and lead, and of silver and indium (which are used in meteorological research). The elimination of interference is described. The rainwater and stream water samples used in the studies on cadmium, lead, and indium were chosen from a pool of about 4000 samples from the 1972 summer of project METROMEX. The METROMEX operations were based in and around metropolitan St. Louis, Missouri, and were aimed, in part, at studying effects of atmospheric pollution that are related to inadvertent weather modification. The wide range of metal concentrations in rainwater and the capricious nature of rainfall volume proved these techniques to be well suited to such measurements. The precision of triplicate determinations was + or - 5% when the amount of analyte dispensed on the ribbon was 10 times the absolute detection limit and the same ribbon was used for all measurements. About 100 determinations could be made before a ribbon had to be replaced.

56139 **APTIC NO. 79879**

Shendrikar, A. D.

CRITICAL EVALUATION OF ANALYTICAL METHODS FOR THE DETERMINATION OF SELENIUM IN AIR, WATER, AND BIOLOGICAL MATERIALS. *Sci. Total Environ., no. 3:155-167, 1974. 42 refs.*

Methods for the sampling and analysis of selenium in air, water, an biological materials are evaluated. The collection of air samples containing selenium presents significant problems because of volatility of selenium compounds. Losses range from 19-38% when ai is sampled at a rate of 2.8 l/min on fiberglass or millipore filters. Samples collected with high-volume samplers show even greater losses. Impingement into water appears to be the most efficient means for collecting selenium compounds from air. Analytical techniques suitable for selenium determinations include: neutron activation analysis, spectrophotometry, polarography, and X-ray fluorescence. Atomic absorption spectrometry and gas chromatography are of limited usefulness.

56140 **APTIC NO. 80905**

Verstraete, W. and J. P. Voets

COMPARATIVE STUDY OF FOUR METHODS FOR THE MICROBIOLOGICAL SAMPLING OF AIR. *Meded. Fac. Landbouwwet. Rijksuniv. Gent, 39(1):280-285, 1974. 2 refs.*

Methods for the sampling of airborne microorganisms were evaluated and compared. The use of a millipore impinger with a gelatine solution was the most practical and reliable method for a wide range of sample concentrations. Impaction on a nutrient agar plate with a Casella slit sampler was practical for air samples that were only slightly contaminated. A disadvantage of the method was that the sampling range was limited by its distance from the electrical power supply source. An inexpensive method for sampling highly contaminated air samples proved to be a gas scrubbing flask containing 50 ml of 0.85% sodium chloride solution and attached to an air volume metering device and an air pump. The variability of the sampling methods ranged from 25-50% and averaged 34%. (Author summary modified)

56141 **APTIC NO. 73228**

Yasuoka, T., S. Mitsuzawa, and M. Mori

ANALYSIS OF AIR POLLUTANTS BY UV RAY IONIZATION METHOD. *(Shigaisen ionkaho ni yoru taiki osenbutsu no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):206, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 63.)*

Basic studies were conducted on the classification and determination of pollutants based on ionization potential. A substance in an electric field irradiated with ultraviolet radiation undergoes the ionization when the energy of ultraviolet radiation corresponds to the ionization potential of the substance, and the flow of ion current is observed. By irradiating with UV of varied wavelength, the substance is identified by the wavelength at which the ionization takes place, and determined quantitatively by the amount of ion current. Using a lithium fluoride ionization chamber and hydrogen discharge tube (800 V, 0.3 A) as light source, a sample gas was injected at a flow rate of one l/min. The line spectrum of the H discharge lamp and experimental results are given. The wavelengths at which the ionization occurred and the ionization potentials of substances were 1660 A (7.41 eV) for triethylamine, 1416 A (8.60 eV) for isoprene, 1347 A (9.13 eV) for benzene, 1286 A (9.56 eV) for trichloroethylene, and 1223 A (10.00 eV) for methylacetylene.

1973

56142 **APTIC NO. 73619**

Angerer, J., A. Haag, D. Szadkowski, and G. Lehnert

NEW METHOD FOR DETERMINATION OF ULTRA-MICRO CONSTITUENTS OF AIR. *(Eine neue Methode zur Luftanlyse im Ultraspurenbereich). Text in German. Z. Klin. Chem. Klin. Biochem. (Munich), 11(3):133-134, 1973. 1 ref.*

A new method for the determination of ultra-micro constituents of air is presented. The aair to be analyzed is dried by blue gel, and admitted into a Dexsil 300-filled thermogradient tube cooled externally with liquid nitrogen. Desorption is done with hot air, and the sample is transferred onto a chromatographic column cooled with liquid nitrogen. The gas-chromatographic separation is done on a silicon oil column heated from -150 C to 200 C at a rate of 7.5 C/min. The fractions thus separated are transferred via a heated capillary to a mass spectrometer for analysis. Chloroform, 1,2-dichloroethylene, tetrachloroethylene, toluene, xylene, mesitylene, n-decane, and quinoline have so far been identified in indoor and outdoor air samples.

56143 **APTIC NO. 80395**

Bodart, F., G. Deconninck, J. Hontoy, and S. Wilk

FILTER PAPER ANALYSIS BY FLUORESCENCE MEASUREMENTS. *Radiochem. Radioanal. Lett., 13(3):161-167, 1973. 1 ref.*

A fluorescent method for the elemental analysis of aerosol samples collected on filter paper is described. A low energy Van de Graaff accelerator is used to bombard the filters with protons (1.7 MeV). The fluorescence X-rays are detected using silicon-lithium and germanium-lithium detectors. More than five filters can be analyzed in less than 1 hr. Sample preparation is very simple, and the analysis is completely free of interference. Typical analytical results are shown for titanium, vanadium, chromium, manganese, iron, nickel, copper, zinc, cadmium, antimony, barium, gold, mercury, and lead. The method is sensitive to the submicrogram level. (Author abstract modified)

56144 **APTIC NO. 80964**

Cohen, A., V. E. Derr, G. T. McNice, and R. E. Cupp

MEASUREMENT OF MIE SCATTERING INTENSITIES FROM MONODISPERSED SPHERICAL PARTICLES AS A FUNCTION OF WAVELENGTH. *Appl. Opt., 12(4):779-782, April 1973. 8 refs.*

The measurement of Mie scattering intensities as a function of the size parameter was done using a tunable dye laser and monodispersed spherical particles. The experimental results were compared with the Mie single scattering theory; a discrepancy in the exact position of the maxima and minima was detected. Agreement between experiment and theory was improved by applying a correction to the manufacturer s index of refraction function for the particles. (Author abstract)

56145 **APTIC NO. 80601**

Esplin, G. J., R. S. Serenius, and A. D. McIntyre

MEASUREMENT AND CHARACTERIZATION OF RECOVERY FURNACE PARTICULATES. A STATUS REPORT. *Pulp Paper Mag. Can., no. 12:T404-T410, Dec. 1973. 8 refs. (Presented at the Canadian Pulp and Paper Association, Technical Section, Annual Meeting, 59th, Montreal, Quebec, Jan. 23-26, 1973.)*

A status report of methods for the measurement and characterization of particulate loadings in Kraft recovery furnace stacks is presented. Topics covered include: field tests of grab sampling techniques and particle size distribution measurements, the dust collection efficiency of various sampling filters, sample train reactions, measurements to determine the relationship between the dust concentration profile and the velocity profile, reference point sampling, sample probe deposition, filter plugging, moisture pick-up, and saltcake particle size distribution assessment. Field test data for the above are presented in tabular and graphical form.

56146 **APTIC NO. 80597**

Kamada, H., Masai Yukawa, and M. Saiki

STUDIES ON THE IMPROVEMENT OF A COMPOSITE DUST SAMPLER AND ITS UTILIZATION IN ENVIRONMENTAL RESEARCH. *International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 181-187. 10 refs (Nov. 12-16.)*

Various methods of sampling airborne dust were examined along with the behavior of radionuclides after a series of nuclear explosions. A filter-type dust sampler was unsuitable for low-level radioactivity surveys, and a Cottrell-type sampler was inadequate for the collection of large amounts of dust. A composite dust sampler, designed to collect and deposit up to 99% of particles with a diameter of 10 micron at a flow rate of 1000/min, produced a yield more than twice as high as that obtained with the conventional Cottrell sampler. The improved sampler was used to observe the monthly variation of airborne radionuclide levels, and short-lived radionuclides due to a nuclear explosion test in the South Pacific Ocean were clearly detected. The diffusion velocity was calculated as 3-4 m/sec. The daily change in the radioactivity ratio of niobium-95/zirconium-95 was used to successfully calculate the fractional contributions of a series of nuclear explosions to the radioactive contamination of airborne dust. (Author abstract modified)

56147 **APTIC NO. 80831**

Kerker, M. and D. D. Cooke

SIZE DISTRIBUTION BY LIGHT SCATTERING FROM INDIVIDUAL PARTICLES. *Croat. Chem. Acta, 45(1):235-246, 1973. 12 refs. (Presented at the International Conference on the Chemistry at Interfaces, 3rd, Rovinj, Yugoslavia, June 27-30, 1972.)*

The particle size distribution of a polystyrene latex was determined using a new light-scattering photometer. The photometer measured the scattered radiance as a function of scattering angle of single aerosolized particles as they were levitated in a laser beam. The results were in agreement with those obtained by conventional light scattering and by electron microscopy. The average particle diameter of the major population group was 784 nm. In addition to this main population, two classes of smaller particles were observed which when averaged into the results gave an average diameter of 764 nm for the entire population of particles. The single particle light scattering technique offers the possibility of analyzing broader size distributions than heretofore amenable to light scattering and possesses the added advantage of not requiring any a priori assumptions about the form of the particle size distribution. (Author abstract modified)

56148 **APTIC NO. 80413**

McFarlin, Whitney A.

DESIGN CONSIDERATIONS FOR MOBILE AIR QUALITY MONITORING LABORATORIES. *Am. Lab., 5(7):75-76, 78, 81-82, 84, July 1973. 4 refs.*

A general review of design considerations for mobile air quality monitoring laboratories is presented. Topics covered include: specifications of the laboratory shelter and instrumentation layout, electrical power requirements, the selection of analytical instrumentation appropriate to the particular pollutants to be monitored, sample acquisition techniques, calibration system design, and data acquisition and display. Emphasis is placed on simplicity of the initial design to insure reliability and flexibility of the integrated system.

56149 **APTIC NO. 73608**

O Neill, Isabel, Benjamin Levadie, and H. B. Ashe

MICROCHEMICAL DETERMINATION OF QUARTZ IN GRANITE DUST SAMPLED BY SIZE SELECTIVE METHODS ON MEMBRANE FILTERS. *J. Test. Eval., 1(3):231-234, 1973. 15 refs.*

A microchemical method for the colorimetric determination of quartz in granite dust sampled by size selective methods on membrane filters is described. The approach involves the elimination of nitric acid digestion to destroy the membrane filter containing the sample, a modification of the Jephcott and Wall method to accommodate low level loading of particulate matter on the filter membrane, and the elimination of the transfer of the quartz released by digestion of the sample in phosphoric acid prior to the final determination by colorimetry. The relative standard error of the method is 12.1% for quartz embedded in a granite matrix which is in the respirable range.

56150 **APTIC NO. 80620**

Saltzman, Bernard E.

ANALYTICAL METHODOLOGIES FOR NITROGEN OXIDES IN PERSPECTIVE. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 317-344. 35 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

A number of studies demonstrated serious errors in the Federal Reference Method for Nitrogen Dioxide. The overall conversion efficiency varies greatly, leading to serious overestimation at low concentrations. The validity and suitability of each analytical method is of the utmost importance. Laboratory evidence is required showing that accurate results are obtained with known mixtures, even in the presence of reasonable concentrations of other pollutants. The unsuccessful Federal Reference Method and some of its predecessors are reviewed. A tentative candidate arsenite method is described. A secondary continuous chemiluminescent method, requiring careful calibration, is described. It is not suitable as a primary standard method. The tentative candidate continuous colorimetric method is based upon contacting a metered air flow with a metered liquid reagent flow and measuring the resulting color in a recording colorimeter. This is the only method for ambient levels that has been collaboratively tested and approved to date. Colorimetric procedures require conversion of nitric oxide to nitrogen dioxide. The system finally recommended for complete conversion comprised an NO2 absorber which produced or absorbed no NO, a humidifier, and an oxidizer. Requirements for a new federal test method and the proper procedure for making the selections are discussed.

56151 **APTIC NO. 73659**

Sprigg, William A.

ESTIMATION OF SULFUR DIOXIDE AND SOILING INDEX FROM OBSERVED SOLAR RADIANT FLUX DENSITY ATTENUATION. *Preprint, World Meteorological Organization and World Health Organization, 9p., 1973. 8 refs. (Presented at the World Meteorological Organization/World Health Organization Technical Conference on the Observation and Measurement of Atmospheric Air Pollution, Helsinki, Finland, July 30-Aug. 4, 1973.)*

Sulfur dioxide is a known absorber of radiation between 0.29 and 0.40 micron of the solar spectrum, and a relationship exists between SO2 and sulfuric acid mists in the atmosphere. Therefore, a significant correlation may exist between the attenuation of the solar beam due to scattering and the ambient SO2 concentration. Measurements of direct solar beam attenuation may thus provide a method of estimating mean citywide SO2 concentrations and values of the soiling index. An experiment was designed to test this hypothesis, incorporating in situ measurements of the direct solar beam attenuation, soiling index, and SO2. In the study designed primarily to determine the characteristics of solar radiant flux density within the urban atmosphere, measurements of solar intensity depletion were taken from February through July 1971 at New Haven, Conn. Observations were confined to midday and periods when the direct solar beam was unobstructed by clouds. Sulfur dioxide and the soiling index were monitored at several urban rooftop sites. The soiling index is an indicator of particulate loading within the atmosphere, and its value is derived from measured transmission of light through a filter tape which has been exposed to a stream of sampled air. In spite of the differences between observed and calculated values of SO2 concentrations and soiling index values, the degree of agreement exhibited was encouraging. The results suggest the possibility of obtaining significant estimates of mean SO2 concentrations or soiling index using measurements of integrated solar attenuation coefficient, wind speed, and ambient temperature where SO2 monitoring equipment or sequential type samplers are not available, inoperative, or too expensive.

56152 **APTIC NO. 80697**

Wrobel, J. S., G. A. Antcliffe, and R. T. Bate

LEAD GERMANIUM TELLURIDE DIODE LASERS. *J. Nonmetals, vol. 1:217-221, 1973. 22 refs. (Presented at the Physics of IV-VI Compounds and Alloys Conference, Philadelphia, Pa., March 24-25, 1972.)*

The use of lead germanium telluride diode lasers for the monitoring of nitric oxide was investigated. Large homogeneous single crystals were grown by a modification of a vapor phase transport technique previously developed for Group II-VI compounds. The diode laser was fabricated by antimony diffusion. The pulsed laser demonstrated the potential for operating in the spectral range of nitric oxide emissions (5.3 micron). However, the narrow range of tuning with temperature places stringent requirements on alloy compositions that must match desired pollutant absorption lines.

1972

56153 **APTIC NO. 73592**

Adamek, E. G.

AN EFFICIENT SEPARATION OF BAP FROM BKF AND THEIR FLUOROMETRIC DETERMINATION IN AIR SAMPLES. *Preprint, American Chemical Society, Washington, D. C., 43p., 1972. 15 refs. (Presented at the American Chemical Society National Meeting, 164th, New York, Aug. 27-Sept. 1, 1972.)*

The suitability of various organic solvents as extractants for polynuclear hydrocarbons from particulate air samples was investigated by determining solubilities and the extraction efficiencies of these solvents. For the fluorometric determination of benzo(a)pyrene (BaP) in air sample extracts, its isolation from compounds of similar fluorescence is necessary, but difficulties are caused by the presence of benzo(k)fluoranthene (BkF). The interference can be minimized by a fluorometric approximation technique provided that BaP does not greatly exceed the amount of BkF. A chromatographic procedure was developed by which BaP and BkF can be separated from each other in a one-step operation directly from the sample extracts. Subsequent or simultaneous fluorometric analysis of these two compounds can be done without mutual interference. After surveying these compounds in the air of nine urban communities in Ontario, attempts were made to correlate differences and changes into their levels with a number of environmental conditions, such as sampling location, wind direction, seasonal variations, effect of temperature inversion, and amount of dust.

56154 **APTIC NO. 80419**

Nicotra, C., A. Cornu, R. Massot, and P. Perilhon

ANALYSIS OF TRACE ORGANIC AIR POLLUTANTS BY CHROMATOGRAPHY COMBINED WITH MASS SPECTROMETRY. *Gas. Chromatogr. Proc. Int. Symp., vol. 9:9-15, 1972.*

The use of gas chromatography combined with mass spectrometry for the identification of trace amounts of organic pollutants in ambient air samples is discussed. Gas chromatography provides an excellent means of separating the components of a mixture, while mass spectrometry provides a means of identifying very small sample quantities. Combining two methods involves recording the corresponding mass spectrum with rapid scanning for each peak of the chromatogram and in the vicinity of the maximum. Analytical results are presented for an air sample collected in an industrial area. Types of compounds identified include: aliphatic and aromatic hydrocarbons, chlorinated hydrocarbons, sulfides, ketones, phenols, and anilines.

56155 **APTIC NO. 73555**

Rehme, Kenneth A. and Frank P. Scaringelli

EFFECT OF AMMONIA ON THE SPECTROPHOTOMETRIC DETERMINATION OF ATMOSPHERIC CONCENTRATIONS OF SULFUR DIOXIDE. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Quality Assuurance and Environmental Monitoring Lab., 18p., 1972 (?). 22 refs.*

The interfering effect of ammonia on the colorimetric determination of ambient sulfur dioxide by the manual pararosaniline method was investigated using permeation tubes to prepare synthetic mixtures of SO2 and NH3 under various humidities. Calibration curves prepared with and without the addition of aqueous NH3 differed by less than 5% when the mole ratio of NH3/SO2 was held constant at a value of 4.7. No significant change in absorbance was observed as the mole ratio of NH3/SO2 was increased from 0-43. The absorbance of the solution began to decrease as the mole ratio approached 50/1. Interferences from gaseous NH3 under low humidity conditions (5%) were only - 0.01 to -0.02 ppm at SO2 levels of 0.3-0.4 ppm and NH3 levels of 0.8-1.1 ppm. At higher levels (1.23 ppm SO2 and 3.40 ppm NH3) an interference of only 0.07 ppm was obtained which fell within the reproducibility of the method. Similar results were obtained under intermediate humidity conditions. As the humidity was increased to 77-80%, the difference due to the presence of ammonia was 15-20%. However, gas phase reactions under these conditions occur in the atmosphere and thus are not considered to be interferences.

56156 **APTIC NO. 80827**

Schildkraut, E. Robert

POLLUTION ANALYSIS USING REMOTE RAMA SPECTROSCOPY. *Am. Lab., vol. 4:23-24, 26, 28-35, Dec. 1972. 4 refs.*

A remote air pollution monitor based on the principle of Raman spectroscopy is described. The instrument possesses the capability of remotely detecting, identifying, and quantifying ppm concentrations of gases and aerosols at kilometer ranges. The laser used is a frequency-doubled ruby type operating at 3472 A. A 36-inch collector is used for maximum sensitivity. The spectrometer is calibrated continuously against atmospheric nitrogen near or at the sample. Typical spectra are illustrated for oxygen, carbon dioxide, water vapor, and a kerosene cloud. The instrument also has the capability of detecting hydrogen chloride, chlorine, ammonia, methane, acetylene, sulfur dioxide, and benzene.

1970

56157 **APTIC NO. 80871**

Khan, A. A., K. Ramarathinam, and K. T. Thomas

AIR SAMPLING FILTER MEDIA THEIR CHARACTERISTICS AND USE. *Bhabha Atomic Research Centre, Bombay (India), Waste Treatment Div., Pollut Hum Environ. Sem. Proc., Bombay, India, 1970, p. 506-517. 2 refs. (Aug. 26-27.)*

A brief summary of various types of filter media that are commonly used, their suitability and limitations for air sampling are presented. A brief review of various properties as evaluated in the laboratory and in the field is presented. Properties and uses of certain air sampling media developed by the Waste Treatment Division, Bhabha Atomic Research Center, are also given. The results of the evaluations are compared with two imported filter media. The mechanism of particulate filtration in air sampling media is briefly presented. (Author abstract modified)

56158 **APTIC NO. 80672**

Pfeifer, R. J., B. Y. Cho, and O. L. Utt

CADMIUM-109 X-RAY ABSORPTION TECHNIQUE FOR THE MEASUREMENT OF SULFUR DIOXIDE IN STACK GASES. *Low Energy X- Gamma Ray Sources Appl. Symp., 3rd, Boston, Mass., 1970, p. 115-122.*

The use of cadmium-109 X-ray absorption for the measurement of sulfur dioxide in stack gases is described. The technique involves the reaction of SO2 stoichiometrically with insoluble mercurous chloride to produce soluble bis-sulfitomercurate ions. The sulfite-mercury complex flows through a glass frit to a measurement cell where the mercury concentration is determined by X-ray absorption, utilizing low energy cadmium-109 X-rays. The intensity of the radiation transmitted through the cell is inversely proportional to the soluble mercury concentration and hence to the SO2 concentration. Sulfur dioxide measurements with an accuracy to within 10% can be made in the 100-5000 ppm concentration range.

1968

56159 **APTIC NO. 80659**

Nagle, Earl and F. J. Norton

GENERAL PURPOSE GAS SAMPLING TUBE. *Rev. Sci. Instr., vol. 1968:1308, Sept. 1968.*

A sample tube is described that will speed complete condensation of condensable liquid air. The interior finger, with funnel for liquid air or nitrogen, or dry ice, sees all parts of the sample container. The sample tube can be used as a 1 atm flowthrough or as a lower pressure vacuum sampling device. Small gas samples can be portioned out when needed.

56160 **APTIC NO. 80833**

Norton, Francis J.

KRYPTON DIFFUSION IN SCINTILLATION COUNTER PLASTIC. *Nature (London), 218(5137):165, April 13, 1968. 6 refs.*

The extent of error in atmospheric radioactive krypton measurements due to the diffusion of the beta emitter (krypton-85) in scintillation counter plastic was assessed. The volume of gas held in the plastic at 25 C and at an equilibrium pressure of 1 atm was almost the volume of the plastic itself. Thus, if the plastic is exposed to krytpon-85 for two or three hours during scintillation measurements, the dissolved gas remaining in the plastic can become important. For precise measurements this gas must be desorbed and pumped away before the next sample is introduced.

AIR QUALITY MEASUREMENTS

1975

56161 **APTIC NO. 73275**

Aizawa, R., K. Hirayoshi, T. Izumi, and T. Mori

ENVIRONMENTAL POLLUTION BY TRAFFIC VOLUME. PART 1: ENVIRONMENTAL POLLUTION BY CO IN AUTOMOBILE EXHAUST GAS. *(Sharyo kotsuryo kara mita kankyo osen, dai 1-ho, jidosha haiki gasus chu CO ni yoru kankyo osen). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 30(1):153, April 1975. (Presented at the Japan. Society for Hygiene, Annual Meeting, 45th, Kyoto, Japan, April 1975, Paper 301.)*

The atmospheric carbon monoxide level in Nagasaki city is measured by a CO analyzer. The continuous 24-hour monitoring is done at seven locations in a residential area and five locations in a business area; spot-sampling analyses are made at 144 locations. The CO level in the residential area was low, and the 24-hour average of the seven locations was 1.4 ppm with the maximum level 3.4 ppm and minimum O ppm. The average of the 144 locations was 1.9 ppm. For the business area, the CO level varied between locations, and higher CO level occurred wherever busy and congested traffic was near the sampling location. The highest CO level observed at the busiest traffic area was 43.1 ppm and its 24-hour average was 19.6 ppm. Data indicated a contribution of automobile exhaust gas to the atmospheric CO pollution.

56162 **APTIC NO. 80537**

Brocco, D., A. Liberti, and M. Possanzini

AIR POLLUTION DUE TO SULFUR DIOXIDE IN ROME: EVALUATION AND PREDICTION. *(Inquinamento atmosferico da biossido di zolfo a Roma: balutazione e previsione). Text in Italian. Riv. Combust., 29(2):61-68, Feb. 1975. 6 refs.*

Air pollution from sulfur dioxide in Rome was evaluated by an emissions inventory and by the measurement of ground level concentrations of the pollutant during the year 1970-1974. A diffusion model was applied, which allowed forecasting, with good approximation, the ground level concentration from emissions and from wind direction and intensity.

56163 **APTIC NO. 80734**

Bucher, A. and C. Lucas

AFRICAN DUST OVER EUROPE. *(Poussieres Africaines sur l Europe). Text in French. Meteorologie, vol. 33:53-69, Jan.-March 1975. 11 refs.*

Meteorological and geological analysis of the periodic phenomenon called pluies de sant (dustfall in strong gusts) illustrates the role of wind in the global movement of fine sediments. The color of snow samples from the Pyrenees from studies in 1972-1975 varied from very pale brown to reddish-brown to pale brown. Quartz was the dominant mineral found in the samples (50-60% by wt) then carbonates (20-30%), illite and kaolinite (10-15%) and organic matter (10%). The 1972 samples contained more carbonates than 1974 samples.

56164 **APTIC NO. 80716**

Demuynck, M. and R. Dams

ONE YEAR STUDY OF TOTAL SUSPENDED PARTICULATE MATTER AT 14 LOCATIONS IN BELGIUM. *Atmos. Environ., 9(11):1033-1035, 1975. 7 refs.*

Daily 24-hour samples of airborne particulate matter were taken at 14 residential, industrial, rural, and background locations in Belgium during 1 yr using High-Vol type samplers and cellulose filters. Mean particulate levels, standard deviations, 50 and 95 percentiles were calculated for all stations. There was a rather high pollution level all over the country. Only half of the stations met the Environmental Protection Agency primary air quality standard of 75 microgram/cu m for suspended particulates. Strong concentration variations as a function of wind directly clearly showed the important influence of general atmospheric conditions and also revealed the existence of intensive particulate sources in the country. (Author abstract modified)

56165 **APTIC NO. 80533**

Grimsrud, E. P. and R. A. Rasmussen

SURVEY AND ANALYSIS OF HALOCARBONS IN THE ATMOSPHERE BY GAS CHROMATOGRAPHY--MASS SPECTROMETRY. *Atmos. Environ., 9(11):1014-1017, 1975. 10 refs.*

A search for and analysis of 19 simple halocarbons in the atmosphere of the rural Northwest United States is reported. The only previously unreported halocarbon found was methyl chloride, but its concentration was relatively large; 530 + or - 30 ppt (1 ppt equals 10 to the -12th power by volume). The analyses of other chlorocarbons detected were in good agreement with previously reported background levels. The background concentrations of chlorofluorocarbons were significantly higher than values obtained by other s using electron capture gas chromatography. Chlorocarbons are more important carriers of chlorine atoms in the troposphere than are chlorofluorocarbons. Chlorofluorocarbons constitute 36% of the organic chloride budget of the atmosphere. (Author abstract modified)

56166 **APTIC NO. 80534**

Grimsrud, E. P. and R. A. Rasmussen

THE ANALYSIS OF CHLOROFLUOROCARBONS IN THE TROPOSPHERE BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY. *Atmos. Environ., 9(11):1010-1013, 1975. 8 refs.*

An analysis of dichlorodifluoromethane (CF2Cl2) and triclorofluoromethane (CFCl3) in rural air samples collected in the Pacific Northwest by as gas chromatography linked directly to a mass spectrometer is described. As little as 5 ppt (1 ppt equals 10 to the -12th power by vol) of each chlorofluorocarbon was detectable in 20 cu cm air samples. This was a significant improvement over the electron capture detector for the direct analysis of CF2Cl2 in air samples representative of background levels. Present background concentrations in Washington state are reported to be 230 + or - 8 and 128 + or - 5 ppt for CF2Cl2 and CFCl3, respectively. (Author abstract modified)

56167 **APTIC NO. 73623**

Hartkamp, H.

STUDY OF THE AIRR POLLUTION SITUATION IN A BIG CITY - BIG CITY AIR PROJECT. *(Untersuchungen zur Immissionsstruktur einer Grossstadt - Projekt Grossstadtluft). Text in German. Schriftenreihe Landesanstalt Immissions und Bodennutzungsschutz Landes Nordrhein-Westfalen, Essen, no. 33:30-38, 1975. 1 ref.*

Results of systematic measurements of air pollutant concentrations in Essen, West Germany, are presented. The air pollutants studied were carbon monoxide, carbon dioxide, nitrogen dioxide, total oxides off nitrogen, fine and coarse dust, lead, zinc, cadmium, benzene, ethane, ethene, propane, propene, ozone, and chlorides. The CO, CO2, hydrocarbons, and nitrogen oxides concentrations were determined almost exclusively by motor vehicle traffic. On workdays, these concentrations were highest between 7 and 9 am, and between 4 and 6 pm. On Saturdays, the concentrations peaked between 11 am and 2 pm, and they were highest around 4 pm on Sundays. The peaks were significantly lower on Saturdays and Sundays than on workdays. The coarse dust concentrations measured at different sites showed practically no correlation with each other, while the fine dust concentrations showed a rather homogeneous distribution over the entire area. A considerable part of the lead originated from sources other than automobile traffic. While rain-out was practically nonexistent for most gaseous air pollutants, dust was washed out efficiently by rain. The relationship established between the pollutant concentrations and the wind velocity can be characterized by a hyperbolic function.

56168 **APTIC NO. 80508**

Matter, L., D. Schenker, and W. Schneider

HEAVY METAL CONCENTRATIONS IN PARTICULATE AIR COMPONENTS OF THE ATMOSPHERE IN INDUSTRIAL CENTERS. *(Schwermetalkonzentrationen in Partikelfoermigen Luftbeimengungen der Atmosphaere von Industrieballungsgebieten). Text in German. Forum Umwelthyg., 1(8):232-233, 1975. 2 refs.*

Results of respirable dust and dust lead concentration measurements, carried out at two sampling sites in Duisburg between Sept. 1973 and March 1975 are presented. The suspended dust concentration was highest during the spring period when the dust lead concentrations were lowest, whereas the lead concentrations were highest in November and December when the dust concentrations were lowest, a finding which indicates that lead is suspended in the air for a longer time during periods of low dust concentration than during periods when the dust concentrations are high, which is due to the coagulation of lead particles with dust particles and to subsequent sedimendation at high dust concentrations. The yearly average lead concentration (1.5 microgram/cu m) was higher than the maximum allowable concentration, possibly due to industrial lead emissions.

56169 **APTIC NO. 79932**

Numakawa, Midori, Shizuko Sato, and Masatoshi Shimamura

PH VALUES AND NEGATIVE IONS IN RAINWATER. *Taika Osen Kenkyu (J. Japan. Soc Air Pollution), 10(4):453, 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., p. 1-4. (Presented at the National Conference on Air Pollution, 16th, Japan.)*

Rainwater samples were collected in Kawasaki City and analyzed for pH, sulfate ion, nitrate, and chlorine ion. Rainwater in the area had lower pH and higher negative ion concentration during the 1974 acid rainfalls. The pH was 3.6 in May, 1967, and 3.3, 3.9, 3.5, and 3.9 from April to July 1970. The Sulfate ion concentration was 87.4 ppm in December, 1966 161.5 ppm in May, 1967, and 114.9 ppm in August, 1967. The negative ion concentration and pH in rainwater o July 4, 1974 are not higher than previously, although this differs for different raindrops. These values were almost constant throughout the year, although harmful acidic rain effects occurred only in summer.

56170 **APTIC NO. 73445**

Okamoto, Masayoshi, Atsuko Uenoyama, Takeo Hashimoto, and Hiromi Yoshida

BEHAVIOR OF ATMOSPHERIC SUSPENDED DUST AND OZONE, PART 4, CORRELATION BETWEEN METAL COMPONENTS IN THE SUSPENDED DUST AND OZONE CONCENTRATIONS. *(Fuyu funjin to ozon tono kyodo ni tsuite, dai 4-ho, fuyu funjinchu no kinzoku seibun to ozon nodo tono sogokankei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 809, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2015.)*

Atmospheric suspended dust and ozone level were measured in the Kawasaki area. The suspended dust was collected during daytime in the summer and winter on a filter by sucking air sample at the rate of 15 l/min at an altitude of 15 m and was analyzed by X-ray fluorescence. During winter there was a negative correlation between the suspended dust and O3 levels; however, during the summer there was a positive correlation between their levels indicating the effect of sea wind during the summer period. More dust amount per unit volume of air was found in the summer and the average dust weight in the summer was 215 micrograms/cu m and that in winter was 145 micrograms/cu m. The total weight of analyzed heavy metals in the dust (copper, manganese, lead, zinc, and iron) was about 1% of the dust weight collected regardless of the season of sampling.

56171 **APTIC NO. 73446**

Sugimae, Akiyoshi and Yuzuru Matsuo

METAL COMPONENTS IN THE ATMOSPHERIC SUSPENDED DUST, PART 17, QUANTITATIVE ANALYSIS OF METALLIC ELEMENTS IN THE SUSPENDED DUST BY EMISSION SPECTROMETRY. *(Fuyu funjinchu no kinzoku seibun, dai 17-ho, hakko bunko bunsekiho ni yoru fuyu funjin chu no kinzoku genso no teiryo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 810, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2016.)*

A simultaneous determination of atmospheric metal components in suspended dust was made by DC arc emission spectrometry with a graphite electrode for beryllium, cadmium, chromium, copper, iron, manganese, nickel, lead, tin, and vanadium. The suspended dust was collected on a glass fiber filter which was then dissolved by hydrogen fluoride and sulfuric acid. Both sodium fluoride and calcium fluoride were used as a buffer agent, but the former gave an extreme stepwise vaporization of metals, while the latter gave good results for metal vaporizations. The metal levels found were 0.000033 to 0.033 micrograms/cu m for Be, 0.0017 to 0.17 micrograms/cu m for Ni, Sn, and V, 0.0033 to 0.33 micrograms/cu m for Cd and Cu, 0.017 to 1.7 micrograms/cu m for Mn and Pb, and 0.33 to 33 micrograms/cu m for Fe.

56172 **APTIC NO. 80797**

Kumamoto Municipal Office, Japan, Sanitary Bureau

INVESTIGATION REPORTS ON ENVIRONMENTAL POLLUTION IN KUMAMOTO CITY, NO. 9. *(Kumamotoshini okeru kogai chosa hokoku, dia 9 ho). Text in Japanese. 181p, July 1975.*

A survey of environmental pollution in Kumamoto is reported. There is a summary of the Kumamoto Municipal Environmental Pollution Control office and its work, a summary of air pollution and pollutants, a summary of noise pollution, a summary of water pollution, and a summary of malodor pollution. The positive Green And Beautiful City campaign of the Kumamoto Municipal Administration commenced in 1972; however, in proportion to the expansion of urbanization, environmental pollution is increasing. The city uses auto exhaust gas inspection devices, dust deposit gauges, oxidant meters, and sulfur oxides analyzers for control of air pollution. Nitrogen oxides and oxidant concentrations reached the environmental standard in 1974, although carbon monoxide and nitrogen dioxide concentrations failed to reach the environmental standard.

1974

56173 **APTIC NO. 73572**

King, Robert B., Harold E. Neustadter, J. Stuart Fordyce, John C. Burr, Jr., and C. Lawrence Cornett

STATISTICAL SUMMARY OF AIR-QUALITY DATA FOR METROPOLITAN CLEVELAND, OHIO, 1967-1972: TOTAL SUSPENDED PARTICULATES, NITROGEN DIOXIDE, AND SULFUR DIOXIDE (TECHNICAL MEMORANDUM). *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 770-18, Rept. NASA TM X-3113, E-7850, 35p., Oct. 1974. 15 refs.*

Air quality data for metropolitan Cleveland, Ohio are collated and statistically analyzed for the period 1967-1972. Mean values of total suspended particulates, nitrogen dioxide, and sulfur dioxide are 104, 191, and 83 micrograms/cu m, respectively. Overall, an improvement is seen during the period studied, though the unusually high amount of precipitation during 1972 (43% above normal) may be responsible for the lower values observed during this year as compared to the previous year. Total suspended particulates during 1972 departed from the lognormal distribution observed in previous years, and the annual mean standard was met at all western suburban stations operated by the National Aeronautics and Space Administration except one; state-operated suburban stations did not measure values of total suspended particulates meeting the standard. Nitrogen dioxide and SO2, although only somewhat lognormal in previous years, also departed significantly from lognormal distributions in 1972. Nowhere in Cleveland were the Ohio standards met for either of these two pollutants. (Author abstract modified)

56174 **APTIC NO. 73238**

Kitagawa, Yoshio, Masatoshi Ito, Akio Sueda, Kan Ryomi, and Akira Furukawa

STUDY ON THE SUSPENDED PARTICULATE IN VARIOUS CITIES OF YAMAGUCHI PREFECTURE. *(Yamaguchi-ken shotoshi no fuyu funjin ni kan suru kenkyu, dai 2-ho). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), vol. 1974:76-81, 1974.*

Investigations were conducted in August 1972 and January to February 1973 at 3 industrial areas including Ube-Onoda, Iwakuni- Kazuki, and Yamaguchi City. A high-volume air sampler with Gelman type A glass fiber filter paper and Toyo GB-100R glass fiber filter paper was used for the sampling, and total dust concentration, water soluble substances, organic substances, and metals in the air were analyzed. The average suspended particulate concentrations at Ube, Onoda, Iwakuni, Kazuki and Yamaguchi were 96, 96, 119, 93, and 55 microgram/cu m, respectively. The average organic substance concentrations ranged from 3.9 microgram/cu m at Onoda to 6.8 microgram/cu m at Kazuki. The sulfate ion concentration was generally high.

56175 **APTIC NO. 73240**

Kitagawa, Yoshio, Akio Sueda, and Kan Ryomi

AIR POLLUTION IN IWAKUNI CITY (IX). *(Iwakuni-shi ni okeru taiki osen ni tsuite, 9-ho). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), vol. 1974:61-65, 1974.*

Results of air pollution measurement in 1972 at 11 locations for dust and 21 locations for sulfur oxides in Iwakuni are given. The total heavy oil consumption increased from 11,879,000 kl in 1970 to 16,882,000 kl in 1972, whereas the total coal consumption decreased from 412,000 tons to 5000 tons. The overall average SOx concentration was 0.33 mg sulfur trioxide/day/100 sq cm and the highest concentration was 0.55 mg SO3/day/100 sq cm at Soko Elementary School. The SOx concentrations generally decreased except for a few areas, as compared to the previous year. The highest average dust concentration was 8.83 tons/sq cm/mo at Higashi High School and the overall average concentration was 6.41 tons/sq cm/mo, an increase of 3.2% from the previous year. Sulfur content in heavy oil was reduced from 1.78% in 1971 to 1.45% in 1972.

56176 **APTIC NO. 73241**

Kitagawa, Yoshio, Kan Ryomi, Akio Sueda, Masatoshi Ito, Keizo Kaneda, and Akira Furukawa

AIR POLLUTION SURVEY IN MINEGIDA AREA. *(Minegida chiku kankyo taiki chosa seiseki ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), vol. 1974:71-75, 1974.*

Measurements of sulfur oxides and airborne particulates concentrations were carried out on July 25-28, 1972 and on Jan. 31-Feb. 3, 1973 in Minegida. Sulfur oxides were measured at 8 locations by using a 24-port sequential air sampler and analyzed by the pararosaniline method. Airborne particulates were sampled at 10 locations with a high volume air sampler with a Gelman type A or Toyo GB-100R filter papers. Metals (calcium, magnesium, iron, manganese, lead, copper, nickel, cadmium, chromium, and cobalt) were analyzed by atomic absorption. Sulfate, nitrate, and chloride ion were analyzed by barium sulfate nephelometry, 2,4-xylenol colorimetry, and mercuric thiocyanate method, respectively, while organic substances were analyzed by benzene extraction. The average SOx concentration ranged from 0.000 ppm on July 25, 1972 (wind velocity 6 m/s) to 0.003 ppm on Feb. 1, 1973 (wind velocity 0.8 m/s), and the highest 1-hour value was 0.078 ppm. The airborne particulates concentrations ranged from 24 micrograms/cu m to 903 micrograms/cu m with an overall average of 189 micrograms/cu m.

56177 **APTIC NO. 73374**

Kitagawa, Yoshio, Akio Sueda, Kan Ryomi, and Masatoshi Ito

AIR POLLUTION AT BOFU CITY, REPORT 4. *(Bofu-shi no taiki osen ni tsuite, dai 4-ho). Text in Japanese. Yamaguchi ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), 1974, p. 67-71.*

Results of air pollution investigations at 15 locations in Bofu city from April 1973 to March 1974 were given. Heavy oil consumption in the area increased from 164,700 kl in 1969 to 282,400 kl in 1972 while coal consumption decreased from 36,950 tons to 26,610 tons. The sulfur content of the heavy oil was reduced from 2.73% to 2.18% during the same period of time. The average sulfur oxides concentration was 0.35 mg sulfur trioxide/day/100 sq m by lead dioxide, with a highest concentration of 0.63 mg SO3/day/100 sq m at Hanaura Elementary School and a lowest concentration of 0.16 mg/SO3/day/100 sq m at Nakanozeki Elementary School. The average dust concentration was 4.93 tons/sq km/mo, with a highest concentration of 6.71 tons/sq km/mo at Hanaura Elementary School and a lowest concentration of 3.75 tons/sq km/mo at Nishiura Elementary School. The high degree of pollution was attributed to the SE wind which carried the pollutants to the downtown area.

56178 **APTIC NO. 73236**

Masuda, Takeshi

PREVENTION OF PHOTOCHEMICAL SMOG IN TOKYO. *(Tokyo-to ni okeru taiki no niji osen taisaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(10):37-45, Oct. 1974.*

Two incidents of air pollution occurred in Tokyo in 1974, which resulted in increased concern on the part of the public and authorities. On May 17, the 1-hour average of oxidant concentration exceeded 0.15 ppm and according to weather forecasts the temperature would be higher and wind would be mild the next day. A photochemical smog warning was issued for May 18. The temperature was 29.5 degrees at noon on May 18 with SE wind at below 3 m/sec. The visibility dropped to 2.0 km at 11 am. The warning was converted to an alert when oxidant concentration at some monitoring stations increased to more than 0.3 ppm, which is the official standard for issuing alerts. More than 3000 plants, schools, and offices were notified and more than 240 facilities each consuming more than 5000 l of heavy oil were asked to reduce their fuel consumption by more than 40%. There were 1620 injuries for that single day but none was serious. On July 3 and 4, 203 persons were injured by acidic rain. Improvement of monitoring stations to speed up measurement and data analysis as well as development of pollution prevention techniques was proposed.

56179 **APTIC NO. 73447**

Momose, A., H. Kurita, H. Uchida, and Y. Nakazawa

ANALYSIS OF MEASUREMENT RESULTS FOR SULFUR DIOXIDE AND AIRBORNE PARTICULATES AT AIR POLLUTION MONITORING STATIONS (1971, 1972, 1973). *(Taiki joji kanshi sokuteikyoku ni okeru nisanka iou fuyu ryushijo busshitsu no sokutei kekka no kaiseki (Showa 46-nen, 47-nen, 48-nen)). Text in Japanese. Chosa Kenkyu Hokoku, Nagano-ken Eisei Kogai Kenkyusho (Rept. Res. Surv., Nagano Prefect. Inst. Public Health, Japan), no. 118:1-62, June 1974.*

Results of semi-automatic, continuous monitoring for sulfur dioxide (SO2) and airborne particulates (dust) during 1971-1973 in Nagano Prefecture Japan, are listed and analyzed. The facilities grew from three monitoring stations in 1971 to 14 monitoring stations in 1973. Yearly average values per hour for SO2 increased slightly during the three-year period. Changes in dust concentrations were erratic. The average amounts of SO2 in the air were higher during the cold quarters of January-March, and October-December. The mode of the hourly average values was lower during the cold months, indicating great variations between high and low values in those months. Two daily peaks in hourly measurements of SO2 and dust concentrations were discernible: one in the morning (9-10 am for SO2 and dust) and one in the late afternoon (3 pm for SO2) or evening (7-8 pm for dust). Measured SO2 and dust values, more often than not, did not meet May 1973 pollutant standards. Refinements in measurements and recognition of equipment limitations are necessary.

56180 **APTIC NO. 73286**

Schaetzle, P.

AIR POLLUTION IN SWITZERLAND. *(Die Luftverunreinigung in der Schweiz). Text in German. Gesundheitstech., 8(11):278-281, 1974.*

Results of air quality measurements taken in various parts of Switzerland since 1967 are reported. In the Swiss Kanton Basselland the sulfur dioxide concentration of the atmosphere has been measured since 1967 at 15 points according to the method by Liesegang. For the first time since 1967, the atmospheric SO2 pollution dropped significantly in 1973. It rose from 4.2 mg SO2/100 hr in 1967 to 6.3 mg SO2/100 hr in 1972 and dropped to 5.4 mg SO2/100 hr in 1973. The highest monthly average was measured in Muttenz (0.04 mg/cu m in July and 0.18 mg/cu m in January). Dust measurements according to Bergerhoff were likewise taken at 15 measuring points. The lead content was determined in the collected dust. The highest lead concentrations were found near busy streets and in the vicinity of the lead working industry. In 1973 fluoride measurements in the vicinity of brick kilns were taken for the first time. The annual average dust concentrations ranged from 91.7 mg dust/sq m/day to 165.6 mg dust/sq m/day. The dense traffic through Brugg in Switzerland has lead to intolerable carbon monoxide, hydrocarbon, dust, and oxides of nitrogen concentrations. The 12-hour maximum allowable immission value of 9 ppm is exceeded most of the time from 6 am to 10 pm.

56181 **APTIC NO. 73356**

Yamate, Noboru and Toshiro Matsumura

ON MONITORING RESULTS OF FORMALDEHYDE CONCENTRATION LEVELS AT KASUMIGASEKI IN TOKYO DURING LAST FIVE YEARS (1968-1972). *(Tokyo kasumigaseki ni okeru saikin 5 nenkan, 1968-1972, no horumu arudehido nodi ni tsuite). Text in Japanese. Eisei Shikensho Hokoku (Bull. Natl. Inst. Hyg. Sci. (Tokyo), no. 92: 71-78, 1974.*

Measurement results of formaldehyde concentration at the National Autoexhaust Monitoring Kasumigaseki Station in Tokyo from 1968 to 1972 were summarized. Formaldehyde was analyzed spectrophotometrically by an automatic analyzer using acetylacetone reagent. The analysis was continuously carried out once every hour. The one-year averages for 1968 to 1972 were 0.76, 1.05, 0.70, 0.80 and 0.70 pphm, respectively. The lowest one-hour value was less than 0.05 pphm in 1968 and the highest 7.3 pphm in 1970. The minimum and maximum hourly average ranged from 0.18 pphm in 1968 to 2.70 pphm in 1969. The concentrations generally was the lowest at 5 am and reached its peak at 1 pm, showing a one-peak pattern. The concentrations on Saturday and Sunday were lower than those of weekdays. High concentrations were recorded during the months of June, July, and August.

56182 **APTIC NO. 73543**

Zalabsky, R. and S. Twomey

MEASUREMENTS OF CLOUD NUCLEI AND AEROSOL SIZE SPECTRA IN THE SEMI- ARID SOUTHWEST. *Preprint, American Meteorological Society, Boston, Mass., 4p., 1974. 9 refs. (Presented at the American Meteorological Society Conference on Cloud Physics, Tucson, Ariz., Oct. 21-24, 1974.)*

Cloud nuclei concentrations and aerosol size spectra were measured in the semi-arid Southwest. Measurements were made daily at a time chosen to minimize the effects of urban and local pollution. Both the cloud nuclei and the size spectra vary with the time of day and general meteorological conditions. They were used to calculate a corresponding set of cloud supersaturation spectra or the number of cloud nuclei activated at a given supersaturation. Cloud nuclei spectra were computed for three model aerosol compositions: an aerosol composed of completely soluble material; an aerosol composed of 40% by volume soluble material (sodium chloride) and 60% completely insoluble but totally wettable material; and a totally insoluble but completely wettable aerosol. The observed cloud nuclei spectra were not predictable from the aerosol size spectra and realistic model aerosol compositions.

56183 **APTIC NO. 73305**

Ibaraki Prefectural Government (Japan), Pollution Control Technical Center

DATA ON THE 1972 SURVEY OF AIR POLLUTION IN IBARAKI PREFECTURE. *(Ibaraki-ken taiki osen chosa shiryo-Showa 47 nendo). Text in Japanese. 382p., March 1974.*

The data on air pollutant measurements in the Kashima and Hitachi areas are presented. Sulfur oxides and suspended particulates were automatically and continuously measured. In addition, sulfur trioxide and suspended particulates were measured in both Hitachi and Kashima, the former by the lead dioxide method and the latter by high vol sampler. Settling particles were measured by a cumulative method. Carbon monoxide was measured by an automatic analyzer utilizing non-dispersive infrared absorption. Nitric oxide and nitrogen dioxide were analyzed by the Saltzman colorimetry, and total hydrocarbons were measured by a flame ionization detector. Oxidants were measured by potassium iodide, and the lead content in automotive emission gases were measured by a high vol sampler and atomic absorption spectrophotometry. The SOx measurements were generally high in both Hitachi and Kashima, but slight improvements were noted over the previous year s records. The total SOx emission quantity in the Hitachi area was only one tenth of the Kashima area, but the annual average was higher in Hitachi. This was probably because the Hitachi area is flanked by mountains, but Kashima is on flat land. Suspended particulates in Hitachi showed no seasonal tendency, but they were higher in winter in Kashima. The numerous lakes and ponds in the Kashima area caused measurement errors due to fog particles. The total suspended particulate quantity, and iron, manganese, vanadium, lead, and cadmium contents were analyzed by colorimetry and atomic absorption spectrophotometry. The total particulates and iron quantities were higher in areas contiguous to iron factories. The Mn, Pb, and Cd concentrations showed considerable geographical differences. With regard to automotive emissions, the quantities were low except for CO. The amount of Pb was very low. Generally, pollution levels were higher on quiet, windless days.

56184 **APTIC NO. 73336**

Environmental Protection Agency (Japan), Air Quality Bureau, Air Pollution Control Div.

AIR POLLUTION SITUATION OF JAPAN IN 1973. *(Showa 49-nendoban Nihon no taiki osen jokyo). Text in Japanese. 984p., 1974.*

The air pollution monitoring results for 1973 are summarized for sulfur dioxide reported from 1071 stations in 379 cities, nitrogen oxides from 329 stations in 192 cities, oxidants from 349 stations in 209 cities, hydrocarbons from 93 stations in 65 cities, carbon monoxide from 100 stations in 71 cities, and airborne dust from 865 stations in 345 cities. The SO_2 pollution has been decreasing since 1966, and the yearly average observed at 22 stations which were in one of the most polluted SO_2 areas ranged from 0.058 ppm to 0.040 ppm in 1972 and in 1973 ranged from 0.047 ppm to 0.037 ppm. The nitric oxide pollution has also been decreasing since 1971. The yearly average of 94 stations for NO level was 0.0250 ppm and 0.0239 ppm in 1972 and 1973 respectively. The oxidants level has not changed during the last few years and its yearly average in Tokyo and Osaka was 0.037 ppm and 0.032 ppm respectively. The highest yearly average for hydrocarbons in 1973 was observed at Shimizu-city, Shizuoka Prefecture, and it was 2.0 ppm equivalent to propane.

56185 **APTIC NO. 73352**

Kure Municipal Office (Japan)

CLASSIFIED AIR POLLUTION INFORMATION BY POLLUTANTS. *(Osen bushitsu betsu no taiki osen). Text in Japanese. Kureshi ni okeru kogai no genjyo to mondaiten (Present Situation Relat. Probl. Environ. Pollut. Kure City), no. 3:9-16, 1974.*

Results of air pollution measurements in 1973 in Kure city are given. Sulfur oxides concentrations measured at 7 locations from April 1973 to March 1974 ranged from below 0.01 ppm to above 0.035 ppm, with an average concentration of 0.013 ppm. The SOx concentrations generally increased in 1973 as compared to 1972. Dust concentrations obtained at 5 locations ranged from 3 tons/sq km/mo to 16 tons/sq km/mo, with an average concentration of approximately 7 tons/sq km/mo. Airborne particulates concentrations measured at 6 locations by a light scattering method ranged from 0.03 mg/cu m at Kamiyamada Elementary School to 0.08 mg/cu m at Nabeyama residential complex. Average nitrogen dioxide concentrations at Umida High School and Umida Fire Department were as high as 0.036 ppm and 0.44 ppm, respectively.

56186 **APTIC NO. 73577**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

SPECIAL REPORT: TRENDS IN CONCENTRATIONS OF BENZENE-SOLUBLE SUSPENDED PARTICULATE FRACTION AND BENZO(A)PYRENE 1960-1972. *Rept. EPA-450/2-74-022. 48p., Nov. 1974. 4 refs.*

NTIS: PB 238 504/AS

Trends in concentrations of benzene-soluble suspended particulate fractions and benzo(a)pyrene from 1960 to 1972 for data from the National Air Surveillance Network as well as other state, county, and local air monitoring programs are described. Trends in the benzene-soluble portion (BSO) of total suspended particulate matter are given for 1960 through 1970 for 126 urban and 25 nonurban sites. Trends for benzo(a)pyrene (BaP), a polynuclear aromatic hydrocarbon present as a component of the BSO fraction, are presented for 1966 through 1970 for 126 urban and 22 nonurban stations. Analyses of BaP and BSO data were also made for 33 urban locations for which data was available for 1971 and 1972. Ambient concentrations of BSO decreased significantly nationwide for urban stations from 1960 to 1970. The composite average of 32 urban stations for which complete data was available dropped consistently from 10.6 to 4.8 micrograms/cu m from 1960 to 1970. Decreases in urban BaP concentrations were also observed, but the limited data available prohibited a statistical evaluation of this change. The composite BaP average of the 32 urban stations dropped about 30% from 1966 to 1970. The decreasing trends in BSO and BaP appear to be continuing for the 33 sites with data available for 1971 and 1972. The nonurban stations for BSO did not show an apparent trend for 1965-1970. However, since 1966 the composite average has dropped from 2.2 to 1.2 micrograms/cu m in 1970. A very slight decline in the nonurban BaP composite average also has occurred. Decreasing coal usage, local open burning ordinances, and automobile controls are probable factors contributing to the observed trends. (Author summary modified)

56187 **APTIC NO. 80979**

Tokyo Metropolitan Government, Bureau of Environmental Protection

MONITORING DATA RESULTS OF AIR POLLUTION BY ORDINARY MONITORING OFFICES, 1974. *(Taiki osen joji sokuteishitsu sokutei kekka hokoku, Showa 49-nendo). Text in Japanese. 91p., 1974.*

Air pollution measurements made at 72 monitoring stations are reported by the Bureau of Environmental Protection of the Tokyo Metropolitan Government. The location of the monitoring stations, and the methods of analysis as well as the results at each station for sulfur dioxide, nitric oxide, nitrogen dioxide, nitrogen oxides, airborne dust, oxidants, hydrocarbons, and carbon monoxide are tabulated.

56188 **APTIC NO. 80980**

Tokyo Metropolitan Government, Bureau of Environmental Protection

MONITORING DATA RESULTS OF AIR POLLUTION BY ORDINARY MONITORING OFFICES, 1974. *(Taiki osen joji sokuteichitsu sokutei deta shori kekka hokoku, Showa 49-nendo). Text in Japanese. 683p., 1974.*

Air pollution measurements made at over 68 monitoring stations during 1974-1975 are reported by the Bureau of Environmental Protection of the Tokyo Metropolitan Government. The data include sulfur dioxide, nitric oxide, nitrogen dioxide, nitrogen oxides, airborne dust, oxidants, hydrocarbons, and carbon monoxide, which were tabulated as 1-hour averages and daily averages.

1973

56189 **APTIC NO. 73501**

Adamek, E. G.

BENZO(A)PYRENE AND BENZO(K)FLUORANTHENE IN URBAN ATMOSPHERES IN ONTARIO. *Ontario Ministry of the Environment, Toronto (Ontario), Lab. Branch, 60p., Sept. 1973. 26 refs.*

Benzo(a)pyrene (BaP) and benzo(k)fluoranthene (BkF) were sampled in the air of 11 urban communities in Ontario during the period July 1971 to July 1972. The highest pollution figures were in the heavy-industrial communities of Welland, Windsor (nearness to Detroit), and Hamilton with BaP and BkF levels ranging 5 to 100 times higher than in the residential and business communities. The levels in Welland exceeded by far those of all other communities investigated and ranged upwards to 116 micrograms BaP and 176 micrograms BkF/1000 cu m air. The main pollution source was a company with a graphite electrode production to supply its large electrolytic smelters and possibly some carbon black manufacture. Very high pollution levels (up to 15 micrograms BaP and 73 micrograms BkF/1000 cu m air) were observed at Windsor where Detroit's steel mills and a coal fired power plant appeared to be the main pollution sources. Similar high levels in Hamilton originate from steel mills and from carbon black manufacture.

56190 **APTIC NO. 73618**

Burger, Alexander

RADIOACTIVITY OF DUST IN BERLIN-DAHLEM. *(Radioaktivitaet und Staub in Berlin-Dahlem im Oktober 1973). Text in German. Meteorologische Abhandl., 135(10), 1973.*

The result of dust concentration measurements carried out in Berlin-Dahlem in October 1973 by the filter adsorption method is presented. The daily averages of the dust concentrations throughout October ranged from 39 to 175 micrograms/cu m. The monthly average was calculated to be 109 micrograms/cu m.

56191 **APTIC NO. 73338**

Ebisawa, E., T. Saijo, T. Takahashi, and H. Kobayashi

SURVEY OF ENVIRONMENTAL DISTRIBUTION OF AIR POLLUTANTS. *(Taiki osen bushitsu no kankyo ni okeru bunpuryo chosa). Text in Japanese. Annu. Rept. Environ. Pollut. Res. Cent. Ibaragi-ken, no. 6:107-115, 1973.*

For the purpose of investigating atmospheric pollution caused by daily living, measurements were made in Kasama city, which is a residential city of population 30,696 with practically no industrial production, during the period of Dec. 3 to 8, 1973. The daily maximum and average concentrations (ppm) were 0.020 and 0.011 for sulfur oxides (peak in the afternoon), 0.112 and 0.024 for nitric oxide (peaks at 9:00 and 19:00), 0.078 and 0.025 for nitrogen dioxide, 4.7 and 2.1 for carbon monoxide (peaks at 9:00 and 19:00), 0.047 and 0.021 for oxidant (peak at 14:00), 0.39 and 0.28 for hydrocarbons, and 0.18 and 0.05 mg/cu m for suspended particulates. The meteorological factors such as temperature, humidity, wind velocity and wind direction were also measured simultaneously. The general trend in environmental pollution was similar to that of other small cities. The SOx concentration was at background levels, while NOx concentration was higher probably due to the effect of traffic at nearby highways. The lower concentration at midday was attributed to dispersion by 6 m/sec wind, and the slight decrease at nighttime is attributable to inversion at relatively low altitude.

56192 **APTIC NO. 73545**

Fechtig, H.

COSMIC DUST IN THE ATMOSPHERE AND IN THE INTERPLANETARY SPACE AT 1AU TODAY AND IN THE EARLY SOLAR SYSTEM. *Nasa Spec. Publ., no.*

319:209-221, 1973. 59 refs. (Presented at the Evolutionary and Physical Properties of Meteroids Celloquium, 13th, Albany, N. Y., June 14-17, 1971.)

GPO

Measurements of cosmic dust abundance obtained by ionization detectors during particle impact and by collectors controlled by either inflight shadowing or by penetration-hole identification are discussed, and a flux model that describes the cumulative flux versus mass is presented. Results from lunar crater statistics agree with results obtained from in situ measurements in interplanetary space and derived from zodiacal-light measurements, while near-earth measurements show an enhancement in the flux numbers by about one order of magnitude. The enhancement may be caused either by secondary lunar debris or by disintegration of low-density fireballs in the outer atmosphere. The calculated daily influx of interplanetary material on the earth is about 25 tons.

56193 **APTIC NO. 79857**

Ivlev, L. S.

FORMATION OF THE SPECTRUM OF SIZES OF AEROSOL PARTICLES IN THE SURFACE LAYER OF THE ATMOSPHERE. *Doklady Akad. Nauk SSSR, 210(2):335-338, 1973. 7 refs. Translated from Russian. Leo Kanner Associates, Redwood City, Calif., 8p., 1974.*

NTIS, DDC: AD A001491

Aerosol particle size distribution measurements made in the surface layer of the atmosphere are reviewed. During the day there is a rearrangement of the distribution function of particles by size which is linked with particle growth by coagulation as well as the movement of particles to higher layers of the atmosphere. A bell-shaped dependence of aerosol count on the temperature of the surrounding medium during periods preceding concentration measurements is explained by the competition process of particle generation which increases with temperature increases and also by the fact that particles are swept upwards by convection currents an turbulence. The Junge formula appears to describe the particle siz distribution of aerosols in relatively polluted areas with high relative humidity, whereas a multimodal distribution corresponding to the Fenn distribution is more characteristic of areas with very pure air and low relative humidity. The Junge formula satisfactorily describes the descending part of the distribution curve (spectral density) for particles of photochemical origin or for those arising from condensation.

56194 **APTIC NO. 73273**

Kobayashi, H., M. Karasawa, and K. Iso

PARTICULATE IN KASHIMA AREA. *(Kashima chiku no funjin ni tsuite). Text in Japanese. Annu. Rept. Environ. Pollut. Res. Cent. Ibaragi Ken., no. 6, p. 65-69, 1973.*

Airborne particulate concentrations were measured in 1973 at 12 locations in the Kashima area and their relationship with metal concentration in soil was studied. The particulate and iron concentrations were high at Nikotate, Kashima Elementary School, and Konchu Construction Co. The highest benzene-soluble substances concentration was found at the Honchu Construction Co., followed by Nikotate. Kashima Elementary School had a high lead concentration of 0.19 micrograms/cu m which was about twice the concentration at any other location. High manganese concentration was found at Nikotate and high vanadium concentrations were found at Nikotate, Kashima Elementary School, and the Honchu Construction Co. Iron, lead, and cadmium concentrations in air were found about twice, 70 times, and 60 times as high as the concentrations in soil, respectively.

56195 **APTIC NO. 73271**

Miyamoto, Toshio

DUST FALL. *(Koka baijin). Text in Japanese. Annu. Rept. Environ. Pollut. Res. Cent. Ibaragi ken, no. 6, 53-69, 1973.*

Investigations of dust concentrations were carried out in the Mizuto, Hitachi, and Kashima areas of Ibaragi Prefecture from May 1973 to April 1974. Total dust concentration and soluble and insoluble substances including iron, manganese, vanadium, calcium, lead, copper, nickel, cadmium, nitrate, sulfate, and chloride were analyzed. Metals were analyzed by atomic absorption while nitrate was analyzed by the sodium salicylate method, sulfate by the Thorin method, and chloride by the Mohr method. The average soluble substances concentrations in Mizuto and Kashima areas ranged from 3.64 to 17.11 tons/sq km/mo and 5.12 to 31.98 tons/sq km/mo, respectively. The average insoluble substances concentrations in the two areas ranged from 2.05 to 9.44 tons/sq km/mo and 2.72 to 26.38 tons/sq km/mo respectively. Dust concentrations in the Hitachi area were generally higher than those in the Mizuto area.

56196 **APTIC NO. 73270**

Ohira, Sadao

PHOTOCHEMICAL SMOG. *(Kokagaku Sumogu). Text in Japanese. Annu. Rept. Environ. Pollut. Res. Cent. Ibaragi-ken, no. 6:38-43, 1973.*

Oxidants concentrations were measured at 1 location in the Hitachi area and 10 locations in the Kashima area in 1973. The yearly average concentration at the Hitachi Kamimine monitoring station was 0.038 ppm and the highest 1-hour value was 0.238 ppm. The yearly average concentration in the Kashima area ranged from 0.028 ppm to 0.050 ppm while the highest 1-hour value ranged from 0.138 ppm to 0.260 ppm. There were 732 injuries by photochemical smog in 1972 but the number was reduced to 207, including 176 students, in 1973. A total of 107 predictions and 46 warnings of photochemical smog were issued in 1973. Most of the predictions and warnings were issued in July and August.

56197 **APTIC NO. 73261**

Ibaragi Prefecture (Japan)

ANALYSIS OF SULFUR OXIDES BY PBO2 METHOD. *(PbO2 ho ni yoru iou sankabutsu). Text in Japanese. In: Annual Report of the Environmental Pollution Research Center of Ibaragi-ken, Rept. 6, p. 44, 1973.*

The observations of the 19 local health offices which monitor the atmospheric sulfur oxides in Ibaragi Prefecture by a lead dioxide method are presented. In the prefecture, the northern part showed the highest SOx level, followed by the western and southern parts, all of which showed a lower level in winter than either spring or summer. The Kashima area, which is located in the sourtheast, showed gradually increasing SOx levels since 1968, and its annual average in 1973 was 2 mg/day/100 cu cm PbO2. The Hitachi area in the northern part showed rapidly decreasing SOx level since 1968, and its annual average in 1968 was 8.5 mg/day/100 cu cm PbO2 which decreased to 4 mg/day/100 cu cm PbO2 in 1973, reflecting the effectiveness of the area SOx emission control.

1972

56198 **APTIC NO. 80721**

Kanitz, S. and P. Orlando

MERCURY IN THE AIR IN GENOA. *(Sulla presenza di mercurio nell aria atmosferica di Genova). Text in Italian. Giorn. Igiene Med. Prevent. (Genoa), 13(3-4):85-99, 1972. 50 refs.*

Two urban districts in Genoa were studied for the presence of mercury in the environment. Atomic absorption spectrometry was used. A total of 140 samples were taken. The median daily concentration of mercury for one zone varied from a minimum of 0.28 to a maximum of 5.32 microgram/cu m, and from 0.14 to 4.90 for the other district. These results are related to studies on the long and short range effects of mercury inhalation in moderate concentrations. Kiryakov noted, in subjects exposed to dosages of about 100 microgram/cu m, a change in the bioelectric activity of the cerebral cortex. Mercury vapors, once in the lungs, move quickly into the blood. According to studies on rats exposed to 1.4 mg/cu m for 5 hour, the mercury is first distributed throughout the organism, and then accumulates in the kidneys. Mercury inhibits urease, invertase, and other sulfhydril transport enzymes; it provokes a loss of potassium ions, blocks glucose consumption by erythrocytes and muscle fibers, and interferes with the transmission of nerve stimuli and of electrical potential at the level of the cellular membrane. The dosage of mercury in the urine and the blood is not indicative of the risk of intoxication. The dynamics of mercury are tied to the reaction of the mercury ions with thiols and to subsequent modifications of the permeability of the cellular membranes with regard to nutritive substances and enzymatic activity. Once the mercury has entered the organism as mercury ions, diffusion proceeds more slowly. It appears that minimum levels of mercury in the air capable of damage probably center around Kurnosov s 8-10 microgram/cu m and Gimadeev s 10-150 microgram/cu m as far as laboratory studies on animals are concerned, and around Korbakova s 10-30 microgram/cu m with regard to humans.

56199 **APTIC NO. 80689**

Zoran, Maria and Valeriu Zoran

MEASUREMENT OF THE NATURAL RADIOACTIVITY OF THE ATMOSPHERIC DUST IN BUCHAREST. *Rev. Roum. Phys., 17(8):901-919, 1972. 21 refs.*

Measurements of the alpha and beta radioactivity of airborne dust over Bucharest were made during the spring of 1971. The radon concentrations at 17 m above ground manifested a typical diurnal variation between 50 and 190 picocuries/cu m. Previously observed dependencies on various meteorological factors were confirmed. The daily variation in dust content of the air over Bucharest exhibited two diurnal maxima, with one occurring at about 2200 hr in the evening and the other at 600 hr in the morning. The double daily peaks appeared to be due to the optimum relative coincidence of changes in emission and dissipation rates of air pollutants during those hours.

56200 **APTIC NO. 73307**

Japan Environmental Sanitary Center

BASIC SURVEY ON THE RELIEF OF THOSE SUFFERING HEALTH INJURY (1971). *(Kenko higai kyusai kiso chosa hokokusho. Text in Japanese. 106p., 1972.*

The concentration of sulfur oxides in 1 hr (ppm/hr) and the quantity of suspended particulates in 24 hr (mg/cu m) were measured during the period from September through December in 1971 in order to study the actual condition of air pollution and to prepare the basic data for execution of relief systems for those suffering health injury. The survey was carried out in Fuji City, the Tsurume ward in Yokohama City, and the central area in Kawasaki City where the concentration of sulfur oxides was over the standard value. Previously collected data were also used as reference in this survey. The concentration of sulfur oxides decreased year after year in the Kawasaki area due to use of heavy oil containing low sulfur and the use of equipment to eliminate sulfur oxides, but the concentration did not decrease to less than 0.05 ppm. In the Yokohama area, the mean value of sulfur oxides was 0.045 ppm to the east of the Tokaido line, and 0.034 ppm to the west. The average concentration was 0.036 ppm in Fuji City and the pollution was concentrated mainly in coastal areas. The concentration of suspended particulate markedly decreased in the coastal industrial district in the Kawasaki area. In the Yokohama area the level of suspended particulates was 120 micrograms/cu m, without great regional differences. The average concentration was 85 micrograms/cu m in Fuji City but its levels changed significantly depending on the day of the week.

56201 **APTIC NO. 73431**

Environmental Pollution Div. of Ishikawa Prefecture (Japan)

MEASUREMENT RESULT OF THE SUSPENDED PARTICULATE AT ISHIKAWA PREFECTURAL INSTITUTE OF HYGIENE AND ENVIRONMENT. *(Eisei kogai kenkyusho ni okeru fuyu funjin sokutei seiseki). Text in Japanese. Ishikawa-ken Eisei Kenkyusho Nenpo (Annu. Rep. Ishihawa Prefect. Inst. of Public Health), no. 9:123, March 1972.*

Airborne dust was collected at the top of the building of the Ishikawa Prefectural Institute of Hygiene and Department in Kanazawa City from 1970 through 1971 using a high volume air sampler. During the investigation, the location of the building was moved to the outer side of the city, which gave lower monthly values for airborne dusts (0.074 mg/cu m) than at the previous location (0.135 mg/cu m). The monthly level of the airborne dust amount has been similar in the past few years, and the yearly values found by averaging monthly values from April to March of 1967, 1968, 1969, and 1970 were 0.103, 0.125, and 0.143 mg/cu m respectively. The dust level in Kanazawa City was lower than that in larger cities.

56202 **APTIC NO. 73432**

Environmental Pollution Div. of Ishikawa Prefecture (Japan)

DATA ON THE LEAD CONCENTRATION MEASUREMENT OF THE SUSPENDED PARTICULATE ON THE STREET. *(Gairo funjin chu no namari nodo sokutei seiseki). Text in Japanese. Ishikawa-ken Eisei Kenkyusho Nenpo (Annu. Rep. Ishikawa Prefect. Inst. Public Health), no. 9:121, March 1972.*

The lead concentrations in airborne dusts collected at three locations in Kanazawa City was measured by high volume air sampler and atomic absorption spectroscopy. The two locations which were at ground level showed collected dust amounts ranging from 337 to 563 micrograms/cu m with lead contents ranging from 2.2 to 4.2 micrograms/cu m. The third location which was 13 m above ground level gave 100 to 222 micrograms/cu m dust of which the lead level ranged from 0.23 to 0.88 micrograms/ cu m. The lead level found at ground level in Kanazawa City was similar to that found in large cities such as Tokyo and Osaka.

ATMOSPHERIC INTERACTION

1975

56203 **APTIC NO. 80572**

Arakawa, Akio

GENERAL CIRCULATION OF THE ATMOSPHERE. *Rev. Geophys. and Space Physics, 13(3):668-680, July 1975. 194 refs.*

There have been extensive compilations of observed data yielding better general circulation statistics, many theoretical investigations of nonlinear processes in planetary fluid dynamics, and continued development of comprehensive general circulation models and their extensive use for simulation experiments during the last 4 yr. The observational studies include mean values, variances, and transports; angular momentum and mean zonal kinetic energy balance; water and total energy balance; available potential energy and kinetic energy balance; potential vorticity balance; spectral analysis; and stratospheric general circulation. Laboratory investigations of thermal convection in a rotating annulus, under imposed temperatures at the inner and outer walls, led to the discovery of three different circulation regimes: the axially symmetric regime, the wave regime, and the irregular regime. There are basically two external nondimensional parameters which control occurrence of these circulation regimes. Theoretical studies include axially symmetric circulation; symmetric and baroclinic instabilities;

barotropic instability and instability of baroclinic jets; interactions between waves and the basic zonal flow; frontogenesis; barotropic instability of the Rossby wave motion; quasigeostrophic turbulence; forced planetary waves and their energy propagation; and closure problems. Reasonably comprehensive models which resolve at least the cyclone scale motions explicitly are being developed and used for numerical general circulation simulation experiments. Several models are described. Sensitivity experiments are discussed. General circulation models were used for numerical experiments under idealized conditions to study specific aspects of the general circulation.

56204 **APTIC NO. 73590**

Barr, S., W. Clements, and D. Dahl

TERRAIN INFLUENCE ON LOW-LEVEL METEOROLOGICAL TRANSPORT. *In: Annual Report of the Biomedical and Environmental Research Program of the LASL Health Division. California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab., Energy Research and Development Administration Contract W-7405-ENG. 36, Rept. UC-48, p. 60-62, Feb. 1975.*

NTIS: LA-5883-PR

Various phases of a research project at the University of California Los Alamos Scientific Laboratory designed to study the effects of terrain on low level meteorological transport in terms off obstructing free-stream flow and generating local temperature gradients which give rise to gravity flows are discussed. Numerical experiments aimed at explaining observed wind profile anomalies in cross mesa flow are being conducted with marker and cell techniques and a finite difference model based on a full set of viscous, non-linear, fluid-flow equations. Particle- in-cell codes with the diffusion parameterized by a simple random walk about a specified mean transport wind are used for calculating rates of dilution as well as transport for complicated, three-dimensional, time-dependent flow fields encountered in regions of complex terrain. A Monte Carlo diffusion code which utilizes the information contained in the entire turbulence spectrum as input is also developed. Preliminary experiments with the release of neutral density balloons in Los Alamos Canyon demonstrate the existence of a large eddy caused by flow separation from the south rim under southerly winds. A field program is being initiated to study the following properties of canyon flows: magnitude, duration, depth, mean velocity, turbulence, temperature cross sections, tracer dilution characteristics, and canyon-mesa interactions.

56205 **APTIC NO. 80830**

Benarie, Michel M.

CALCULATION OF THE MEAN YEARLY MIXING HEIGHT OVER URBAN AREAS, FROM AIR POLLUTION DATA. *Sci. Total Environ., vol. 3:259-265, 1975. 15 refs.*

Conditions for the usefulness of the ventilation-volume or box model in the representation of long-term averages of pollutant concentrations are considered, and the calculation of mixing height yearly averages from air pollutant concentration data (without reference to meteorological observations) is demonstrated. The average mixing heights thus obtained are adequate to rapidly characterize an urban area in terms of low, medium, or high pollutant concentrations. Moreover, if the average mixing height is already known for one city from data about one pollutant, then it is easy to estimate the average concentrations of other pollutants. Extimates of yearly average mixing heights for six French and two Japanese towns are given. (Author abstract modified

56206 **APTIC NO. 80852**

Bennett, Charles L., Jr.

CLIMATE OF THE SOUTHEAST DESERT AIR BASIN. *California Air Resources Board, Sacramento, Div. of Technical Services, 27p., July 1975. 12 refs.*

The climate of California s Southeast Desert Air Basin is reviewed with particular emphasis on the meteorological aspects of air pollution potential. The northern part of the basin is sheltered from maritime influences and gross inter-basin transport of air pollution by mountain barriers extending from north to south. Entry points into the Mojave Desert where some limited inter-basin transport may occur include the Tehachapi Pass, Soledad Canyon, Cajon Pass, Morongo Valley, and Yucca Valley. During all seasons the prevailing wind direction is from the south and west. A southeasterly flow into the Imperial Valley, however, represents a possible entry point of pollutants from the heavier populated areas in Mexico. Radiation inversions are prevalent during the nights throughout the year and persist throughout much of the day during the winter, limiting the mixing in the lower atmosphere to a height of 200-2000 ft.

56207 **APTIC NO. 80568**

Bigg, E. K.

ATMOSPHERIC PARTICLES AND THE WEATHER. *Clean Air (J. Clean Air Soc. Australia New Zealand), 9(3):44-48, Aug. 1975.*

The properties of atmospheric particles that have an effect on weather were examined and related to a global monitoring station in Australia. Air pollution is a prolific source of small and very small hygroscopic particles leading to very high concentrations of small cloud drops. This affects the cloud s properties of reflecting and scattering light as well as adversely affecting its ability to rain. Some industrial processes produce large hygroscopic particles as well as small ones, but attempts are made to suppress the former because of their deleterious effects on nearby objects. Where they are created in large numbers they may to some extent offset the effects of the smaller particles by aiding the precipitation process. The monitoring station provides information on the possible relationship between local effects and local pollution. Below the cloud base or inversions the particle concentrations were much higher than over Tasmania. Concentrations from 500 to 5000 cu cm were typical. Cities and industrial processes involving sulfur dioxide emissions were responsible for intense local pollution, but grass and bush fires were the most important sources of both large and small particles over the country as a whole.

56208 **APTIC NO. 80906**

Calvert, Jack G.

REPORT TO THE COORDINATING RESEARCH COUNCIL ON A PRELIMINARY ANALYSIS OF THE CHEMICAL ASPECTS OF THE DATA FROM LARPP OPERATION NUMBER 33 OF NOVEMBER 5, 1973. *Preprint, Ohio State Univ., Columbus, 60p., 1975 (?). 14 refs.*

A preliminary analysis of photochemical smog data obtained during one operation over the Los Angeles Basin on November 5, 1973 is presented. Topics covered include: meteorological conditions during the study period, the relation between ozone, nitric oxide, and nitrogen dioxide; the chemical role of hydrocarbons in the formation of photochemical smog; the reactivity and rates of chemical transformations involving hydrocarbons; the nature of hydrocarbons which carry the hydroxyl-hydroperoxyl chain oxidation of nitric oxide to nitrogen dioxide; and nitrogen oxide transformation and removal mechanisms. An analysis of the data indicates that meaningful relationships exist between concentrations of ozone, nitric oxide, and nitrogen dioxide.

56209 **APTIC NO. 73422**

Chiba, Shozo, Yoshio Saiki, Koji Nagami, and Saburo Sugano

OFFENSIVE ODOR MEASUREMENTS AT THE STOCK RAISING YARD AND ITS DIFFUSION. *(Chikusanjo shuhen ni okeru akushu no sokutei to kakusan). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:37, Feb. 1975.*

Offensive odor from 11 stock raising facilities was analyzed. Ammonia was found in all facilities, however trimethylamine and hydrogen sulfide were detected only in a few facilities. The average ammonia level found within the grounds of the facilities was 0.56 ppm and that at the boundary of the facility grounds was 0.18 ppm. No apparent difference in the diffusion of odor was observed between facilities raising different stock such as chickens, pigs, and cows. The diffusion of odorous gas could be expressed in the following equations: the diffused odorous gas concentration at a distance x from the source equals the initial odorous gas concentration times exp (-ax) in which a is a constant.

56210 **APTIC NO. 80387**

Cowan, George A., Donald G. Ott, Anthony Turkevich, Lester Machta, Gilbert J. Ferber, and Norman R. Daly

HEAVY METHANES AS ATMOSPHERIC TRACERS. *California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab., Energy Research and Development Administration Contract W-7405-ENG. 36, Rept. UC-11, 4p., March 1975. 7 refs.*

NTIS: LA-5936-MS

Studies involving the use of heavy methanes as atmospheric tracers were conducted. Methane-21 was considered as a potentially useful nonradioactive label for tracking air motions and testing transport and diffusion models on a continental scale because of the isotope s virtual non-existence in nature and its slow isotopic exchange. A release of 84 g of methane-21 was detected in the atmosphere at concentrations ranging from 2 to 7 times 10 to the -17 by volume at distances from the release point ranging from 1500-2500 km. The arrival time of methane-21 at each of four stations was in reasonable agreement with calculations based on a meteorological model, although the concentrations were usually considerably lower than predicted. (Author abstract modified)

56211 **APTIC NO. 80692**

Dana, M. Terry and J. M. Hales

WASHOUT COEFFICIENTS FOR POLYDISPERSE AEROSOLS. *Battele Memorial Inst., Richland, Wash., Pacific Northwest Labs., Atomic Energy Commission Contract AT(45-1)-1830, 20p., 1975 (?). 12 refs.*

NTIS: BNWL-SA-5080

The theoretical rain washout coefficient concept is extended to account for the polydispersity of aerosols. Collection efficiencies and polydisperse washout coefficients are calculated for particle sizes ranging from 0.001-10 micron in terms of diffusion, impaction, and inertial mechanisms. A knowledge of the particle and raindrop size dependency of the collection efficiencies is required for the calculation of washout coefficients and is extremely difficult to obtain experimentally, making the use of experimental data for testing particle washout theory practically impossible.

56212 **APTIC NO. 80501**

Fritz, Markus

THE DANGER OF THE FLUORINATED HYDROCARBONS. *(Die Gefahr der Fluorkohlenwasserstoffe). Text in German. Schweiz. Bautztg., 93(45):729-730, Nov. 1975.*

The hazards of fluorinated hydrocarbons are discussed in connection with the Lovelock experiments. Fluorinated hydrocarbons, penetrating into the stratosphere, destroy the protective ozone layer under the influence of ultraviolet radiation, and thus may enhance the hazards of UV radiation- induced skin cancer. A direct relationship between skin cancer and intense UV radiation is suspected, but has not yet been demonstrated. Related experiments show that in addition to fluorinated hydrocarbons, also chlorinated hydrocarbons, such as carbon tetrachloride, part of which may be generated by natural sources in heterogeneous photochemical reactions from methyl chloride, can play a certain role in the destruction of the stratospheric ozone layer.

56213 **APTIC NO. 79853**

Hanna, Steven R.

MODELING SMOG ALONG THE LOS ANGELES-PALM SPRINGS TRAJECTORY. *Preprint, American Chemical Society, Washington, D. C., 44p., 1975. 41 refs. (Presented at the American Chemical Society Division of Environmental Chemistry Meeting, Philadelphia, Pa., April 7-10, 1975.)*

Observations of smog concentrations during the summer of 1973 in Lo Angeles, Pomona, Riverside, Banning, and Palm Springs were presente and reveal that high oxidant concentrations at Banning and Palm Springs are often due to advection of smog from source regions in the more densely populated western part of the Los Angeles basin. At Pomona and Riverside, advection from upwind source regions combines with the effect of local emissions to cause long durations of high oxidant concentrations with peak times in the mid afternoon An empirical model for the diurnal oxidant variation is suggested which satisfactorily simulates observed concentrations. More complex models which include chemical kinetics systems do not perform very satisfactorily at the rural stations of Banning and Palm Springs, especially at night when observed oxidant concentrations remain high. (Author abstract modified)

56214 **APTIC NO. 73217**

Hayakawa, K., Y. Sano, and C. Ko

ANALYSIS AND FORECASTING OF URBAN-TYPE AIR POLLUTION BY COMPUTER. *(Konpyuta ni yoru toshigata taiki osen no kaiseki oyobi yosoku). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(2):37-46, Feb. 1975. 9 refs.*

Pollution by sulfur oxides (SOx) in Metropolitan Tokyo and Kawasaki City was examined by use of computer. Box models for atmospheric diffusion concentrations were used in calculations. Calculated data were compared with actual data and they more or less agreed. Predicted SOx concentrations under proposed regulations are given.

56215 **APTIC NO. 79967**

Hiraoka, M., A. Ikeda, and M. Sasakura

ON THE EFFECT OF THE URBAN HEAT ISLAND PHENOMENON ON ATMOSPHERIC DIFFUSION. *(Toshi hito airando gensho no taiki kakusan denpa e oyobosu koka ni tsuite). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, p. 679-680, 1975. 1 ref. (Presented at the Japan Society of Civil Engineers, Annual Meeting, 30th, Nagoya, Japan, Oct. 1975.)*

The higher temperature of the urban atmosphere in relation to the surrounding area is called the urban heat island phenomenon. The effect of heat islands on the vertical structure of the urban atmosphere and the diffusion propagation mechanism of flue gas emitted from factories in the surrounding area is not clearly known The effects of heat islands on the stream line of wind in the urban atmosphere were investigated by calculations based on assumed ideal conditions and a water tank experiment. Using the method of Malkus and Stern, the effects of heat islands and cool islands on the wate stream line were calculated, and applied to the case of the urban atmosphere. The existence of a lid had a marked effect on the stream line distribution, and the stream line was slightly declined at the leeward.

56216 **APTIC NO. 80588**

Holt-Jensen, Arild

ACID RAINS IN SCANDINAVIA. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 118-122, June 1975. 14 refs. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.) (Presented in Ecologist, Oct. 1973.)*

GPO

The problem of increasingly acidic rain and snow over Scandinavia is reviewed. The yearly deposition of sulfuric acid in the Scandinavian area amounts to 1-2 g of concentrated H2SO4/sq m; periods of high acidity occur between 10-20 times a year. The highly acidic precipitation appears to be due to industrial air pollution originating in northwest Europe, especially in Britain. The continued increase in precipitation acidity is expected to eventually effect forest growth and the population of fresh water fish, though exact estimates regarding these effects can not be made at present.

56217 **APTIC NO. 73612**

Humphrey, Paul A.

METEOROLOGICAL SUPPORT AND EVALUATION FOR HAZARDOUS CARGO EMERGENCIES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Meteorology Lab., 25p., April 1975. 23 refs. (Presented at the Transport of Hazardous Cargoes by Sea and Inland Waterways, International Meeting, Symposium, 4th, New Orleans, La., April 13-17, 1975.)*

The role of the meteorologist in evaluating thee potential hazard in emergency situations where cargoes of toxic gases are involved is discussed. Although on-site observations of upper winds and atmospheric stability conditions, weather forecast information, and mathematical estimates of gas concentrations can be used for delineation of possible hazard areas, uncertainties exist due to the fact that there is no actual experience with the sudden release of large amounts of liquefied gas from a cargo-size tank that may contain 100 tons or more. There is also considerable uncertainty about the behavior of a gas cloud during an underwater release. More information is also needed about the effects of rapid expansion and cooling at release and possible effects related to the density of the gas. (Author abstract modified)

56218 **APTIC NO. 80732**

Ishiguro, Ichiro

STUDIES OF A NEW CALCULATION METHOD FOR AIR POLLUTION ON THE ROAD. *(Jidosha doro no taiki osen ni kansuru kenkyu). Text in Japanese. Nippon Kenchiku Gakkai Ronbun Hokokushu (Trans. Archit. Inst. Japan), no. 234:69-79, Aug. 1975. 6 refs.*

Based on the new concept of a model of equal space in pollution, a calculation method for pollutant diffusion in the vicinity of roads was developed. In the existing models for linear continuous sources or rectangular column sources, only the diffusion due to the wind in the intersecting direction is considered. Therefore, the pollutant concentration at windless states is given as infinity, which does not agree with the finite value in reality. In the method described, a model of the diffusion wake in the back stream of moving cars, and a model of equal space for diffusion due to cars running on an equal space line were combined. The Bosanquet-Peason system was adopted for the calculation of the model of the wake. Descriptions of the concept, calculation equations and calculation procedures are given. Calculation results for carbon monoxide, nitrogen oxides, and hydrocarbon concentrations at windless, 1 m/s, 5 m/s and 7 m/s in the intersecting direction were in good agreement with the measured values, indicating the adequacy of this model for practical application.

56219 **APTIC NO. 80528**

Johnston, Harold S.

GLOBAL OZONE BALANCE IN THE NATURAL STRATOSPHERE. *Rev. Geophys. Space Physics, 13(5):637-649, Nov. 1975. 67 refs.*

The method of global instantaneous rates was applied to the question of whether the photochemical reactions of oxygen species (O2, O and O3) and air motions are sufficient to account for the natural ozone balance in the stratosphere. The distribution of radiation over wavelength, photochemical rate constants, and reaction rates were evaluated in each cell of a three dimensional grid. The Chapman reactions and air motions were insufficient to give a global ozone balance. These factors accounted for only 20% of the O3 produced below 45 km. The water reactions (hydrogen, H oxygen, and HOO radicals) balanced 10% of the O3 produced below 45 km. Recently observed concentrations of nitrogen dioxide at up to 36 km elevations are close to those required to destroy the remaining 70% of naturally produced O3. Until enough measurements are made to characterize the vertical, latitudinal, and seasonal distribution of nitrogen dioxide, it is not known whether other substances (such as chlorine, bromine, and metallic oxides) play a significant (10% or more) role in the natural O3 balance. (Author abstract modified)

56220 **APTIC NO. 80443**

Kern, C. D.

A TRAJECTORY AND DISPERSION COMPUTER PROGRAM WHICH USES OBJECTIVELY ANALYZED, OBSERVED OR FORECAST METEOROLOGICAL FIELDS. *In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. Du Pont de Nemours (E. I.) and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, p. 10-1-10-11, June 1975. 5 refs.*

NTIS: DP-1374

A computer program which generates two-dimensional horizontal or terrain-following trajectories is described for producing relatively quick estimates of dispersion from multiple elevated point sources. The standard plume equation is solved along the centerline of these trajectories. The appropriate dispersion parameters necessary for calculating the concentration along the centerline of such plumes are derived by two methods, viz., one adapted from Slade and the other which is a modification of the Brookhaven National Laboratory method. The modified BNL method gives much lower centerline values for concentrations and wider downwind plumes than the Slade method.

56221 **APTIC NO. 80445**

Kern, C. D.

PRELIMINARY MESOSCALE CALCULATIONS FOR THE SOUTHEASTERN UNITED STATES USING THE TWO AND ONE-HALF DIMENSIONAL LAVOIE MODEL. *In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. Du Pont de Nemours (E. I.) and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, p. 9-1-9-13, June 1975. 8 refs. (Presented at the Symposium on Atmospheric Diffusion and Air Pollution, Santa Barbara, Calif., Sept. 9-13, 1974.)*

NTIS: DP-1374

A three layer, two and one-half dimensional Lavoie model was developed to provide the meteorological parameters necessary for calculating the location, time, and concentration of pollutants accidentally released to the atmosphere. The model included the surface influences of friction, heating, and topography. The three layers in the model were a constant flux layer at the surface, a well-mixed homogeneous layer, and a deep stable upper layer. A vector display of the wind fields was calculated from the model over a grid of the Southeastern United States. The effect of elevation and surface drag were observed clearly. The effect of the boundary was corrected by applying a four-grid smoothing operation along the boundary in subsequent versions of the model. The model appears to be a step forward in the development of a model for forecasting meteorological parameters necessary for pollution transport modeling.

56222 **APTIC NO. 80637**

Kern, C. D.

A COMPUTER PROGRAM FOR OBJECTIVE ANALYSIS AND DISPLAY OF METEOROLOGICAL FIELDS. In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. du Pont de Nemours (E. I.) and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, 8-1-8-15, June 1975. 3 refs.

NTIS: DP-1374

A computer program for the objective analysis and display of meteorological fields used as input to trajectory/diffusion models is described. The model is particularly designed for analyzing meteorological variables over selected regions of the southeastern United States. The analysis procedure is basically a method of successive corrections to a first guess field. This analysis scheme differs from the conventional macroscale analysis programs in that a variable scan radius is used rather than a fixed scan radius. The more dense the data coverage, the smaller the scan radius. The program is currently a two-dimensional one; values are analyzed only along horizontal or terrain-following surfaces without vertical links.

56223 **APTIC NO. 80851**

Kinney, John J. R.

CLIMATE OF THE SOUTH CENTRAL COAST AIR BASIN. *California Air Resources Board, Sacramento, Div. of Technical Services, 36p., July 1975. 50 refs.*

The climate of California s South Central Coast Air Basin is reviewed with particular emphasis on the meteorological aspects of air pollution potential. The terrain of the basin is quite varied, consisting of a rugged coastline, numerous northwest-southeast oriented mountain ranges, and hills interspersed with valleys. The basin possesses a Mediterranean type of climate. The combination of stable atmospheric conditions and light winds during the nights suggests that this time of the day possesses the highest potential for the production of high ground level pollution concentrations in the basin, particularly for interior areas. The pollution is usually localized since the wind transport is weak in these cases. There are essentially three types of inversions that affect the basin, with the most prevalent type being the radiational inversion which forms in the interior regions during cloudless nights year round. The frequency of low inversions is generally greater in the morning than during the afternoon along the coastal areas of the basin. Inversions are generally destroyed inland by the stronger sunlight so that mixing heights usually exceed 3000 ft by the afternoon.

56224 **APTIC NO. 80416**

Koper, Chester A., Jr. and Willy Z. Sadeh

AN INVESTIGATION OF TURBULENT TRANSPORT IN THE EXTREME LOWER ATMOSPHERE. *Colorado State Univ., Fort Collins, National Aeronautics and Space Administration Contract NAS8-28590, Rept. NAS-MSFC-2(CER74CAK-WZS34), NASA CR-2567, M145, 240p., Aug. 1975. 70 refs.*

A model for the evaluation of the Lagrangian turbulent velocity autocorrelation and its experimental substantiation in the extreme lower atmosphere is presented. Verification of the model is accomplished by simulating the turbulent flow in the atmospheric layer up to about 5 m using the wake flow generated by a large diameter fan installed on flat grassland. Stationarity test results indicate that the turbulent velocity can be approximated as a realization of a weakly self-stationary random process. The streamwise changing properties of turbulence are deduced from a set of five Eulerian autocorrelations. The concentration of diffusing material along the turbulence line is predicted by employing the momentum exchange and dispersion coefficients computed by means of a Lagrangian autocorrelation. The computed concentration distribution along the turbulence line is compared with measured concentrations of sulfur hexafluoride which was used as a gas tracer in a diffusion experiment. Both concentrations exhibit a striking congruent variation with increasing axial distance along the turbulence line and differ from each other by 4-13% at the most. (Author abstract modified)

56225 **APTIC NO. 80877**

MacCracken, M. C.

DOT-CIAP PROGRAM -- THIRD ANNUAL REPORT. *California Univ., Livermore, Lawrence Livermore Lab., Energy Research and Development Administration Contract W-7405-Eng-48, 33p., May 20, 1975. 44 refs.*

NTIS: UCRL-51336-75

Several problems associated with the effects of large numbers of aircraft operating in the stratosphere on global climate were investigated using mathematical models. Single plume and flight corridor models were developed for the wake concentration history in the transition region from the stabilized aircraft wake to the global scale. One and two dimensional numerical models were developed to simulate the evolution and distribution of trace species in the stratosphere. They are intended for time dependent calculation of the stratospheric response to the injection of trace species. The zonal model is a two-dimensional atmospheric model. It calculates the mean zonal and meridional atmospheric motion and tthe thermal and hydrologic interactions of the air, ocean, and earth. The stratospheric kinetics model simulates the chemical and photochemical kinetics of the stratosphere. The various radiation transport problems that have been addressed include the solar and long-wave effects of a stratospheric aerosol layer, the effects of decreased ozone concentrations and increased nitrogen dioxide concentrations on solar fluxes, and the effect of molecular multiple scattering and surface albedo on photodissociation rates. Spectral data from satellite borne ozone sensors were analyzed. The daily variability was 0.8%. This could occur by several mechanisms; the photochemical approach is briefly discussed. Work to provide meteorological guidance for modeling focused on the following areas: climatic effect of sulfur oxides emissions into the stratosphere, volcanic dust loadings and optical depths in the stratosphere, stratospheric transport, variation of solar ultraviolet flux, and exchange or residence time between the stratosphere and troposphere.

56226 **APTIC NO. 79935**

Makino, Hiroshi, Hideko Nojima, Yoshio Saiki, and Yasuji Himi

RELATIONSHIP OF RAINFALL COMPONENTS TO AIR POLLUTION (REPORT NO. 1). *Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):133, 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., 3p. (Presented at the National Conference o Air Pollution, 16th, Japan, Paper 12.)*

The components of normal rainfall were studied to investigate the possibility of its use as an indicator of atmospheric pollution There is little mutual dependence between pH and negative ion components. This suggests that more of the negative ions in the atmosphere exist in the state of salts, rather than in the acidic state, which influences the pH values. There is a considerable mutual dependence between sulfate and nitrate ions. This suggests that they come from a common source. About 60 to 80% apparently comes from industrial exhaust gases, automobile exhaust gas, and other human activities. The mutual dependence of the amounts of chlorine ion, sulfate, and nitrate is quite strong. Ammonium ion and sulfate concentrations are strongly dependent on each other. This suggests that most of the ammonium ion in the atmosphere is in the form of ammonium sulfate. This may also be related to the weak dependence of pH on the negative ion component. Formaldehyde and acrolein show a strong mutual dependence. Possibly they come from common source, such as automobile gas. The dependence of nitrate o formaldehyde is stronger than that of sulfate. More formaldehyde may come from automobile exhaust gas, rather than from industrial exhaust gas, since nitrate comes from automobile exhaust gas as wel as from industrial exhaust gas, while sulfate comes mainly from industrial exhaust gas. There is a strong relation between electrical conductivity and ion component.

56227 **APTIC NO. 80735**

Mizuno, Tateki

ANALYSIS OF THE DISPERSION FROM ELEVATED SMOKE SOURCE. *(Kosho engen kara no kakusan no kaiseki). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 97, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

Suitable parameters and stability classification for the estimation of the diffusion width of smoke from an elevated smoke source were investigated by air tracer experiment at a spray height above 100 m. The relationship between the distance to the point with maximum concentration and the vertical diffusion width was evaluated with regard to the Pasquill stability classification. The Pasquill A-F classification can be used; however, parameters other than light intensity and ground wind velocity have to be used. The reclassification of the Pasquill stability was attempted with satisfactory results, using as variables the mean gradients of mean wind velocity against smoke source height, and the temperature difference between ground level and smoke source height against smoke source height.

56228 **APTIC NO. 80745**

Moore, D. J.

A SIMPLE BOUNDARY-LAYER MODEL FOR PREDICTING TIME MEAN GROUND-LEVEL CONCENTRATIONS OF MATERIAL EMITTED FROM TALL CHIMNEYS. *Proc. Inst. Mech. Engrs. (London), 189(4):33-54, 1975. 33 refs. (Presented at the Institution of Mechanical Engineers, Ordinary Meeting, London, England, Feb. 12, 1975.)*

A simple boundary layer model was developed for predicting time mean ground level concentrations of material emitted from tall chimneys. The theories are only applicable to dispersion in two dimensional flows over flat surfaces, though they could be extended to flows over undulating surfaces if the streamline pattern could be predicted. The prediction techniques are not reliable in situations where the flow is significantly perturbed by the surface topography. In such situations wind tunnel studies are of great value. They can also be used to study many of the basic phenomena involved in plume dispersal. (Author conclusions modified)

56229 **APTIC NO. 80753**

Nguen, Thi Kien and A. K. Khrgian

SOME PECULIARITIES OF ATMOSPHERIC OZONE IN TROPICAL ZONES. *(Nekotorye osobennosti atmosfernogo ozona v tropicheskoy zone). Text in Russian. Vestn. Mosk. Univ., Fiz., Astron., no. 4:452- 458, 1975. 3 refs.*

The results of comprehensive ozone monitoring series conducted in the tropical zone between NL 40 and SL 40 during the 1957-1969 period are presented. Low and fairly stable ozone concentration belt was found along the equator, with both the concentrations and its fluctuations increasing toward the northern and southern borders of the tropical zone, which is due to a correspondingly increasing variation in the solar radiation intensity with increasing distance from the equator. Considerable reduction of the ozone concentrations was found in typhoons, which is apparently due to the ascendant motion of the air masses.

56230 **APTIC NO. 73221**

Nishi, Ryo and Teruo Sawada

AIR POLLUTION PREDICTION AT THE AIRPORT ON THE SEA. *(Kaijo kuko ni yoru taiki osen no yosoku). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 161-164, 1975. 6 refs. (Presented at the Japan Society of Mechanical Engineers, Lecture Meeting, Tokyo, Japan, April 1-3, 1975, Paper 750-5.)*

A puff diffusion model is required for air pollution prediction at airports on the sea because of the unique meteorological conditions on the sea, the moving conditions of airplanes, and the short period of time of pollution. The pollution prediction model includes background pollution, pollutions by access transportation, airplanes, service automobiles, and by ground facilities. The pollutions by access transportation and service automobiles are calculated from numbers of vehicles involved and emission concentrations. A tracer experiment was carried out at three locations on the sea scheduled for new airports. Tracer (sulfur hexafluoride) was released from a helicopter from 1:30 pm to 3:00 pm and air was sampled on shore from 2:00 pm to 3:00 pm. Experimental values were in good agreement with calculated values obtained from the prediction model.

56231 **APTIC NO. 80731**

Ogawa, Toshihiro

STRATOSPHERIC OZONE DISRUPTION BY CHLORINE COMPOUND. *(Enso kagobutsu ni yoru seisoken ozon no hakai). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 159, 1975. (Presented at the Osaka District Meteorological Studying Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

The danger of stratospheric ozone destruction by Freon gas (CF2Cl2, CFCl3) has been pointed out. The chlorine ion produced by photo-dissociation of Freon reacts with O3 (Cl + O3 yields Cl0 + O2, Cl0 + O/NO yields Cl + O2/NO2), reducing the O3 concentration in the stratosphere. Chlorides in the stratosphere are mostly in the form of hydrogen chloride and Cl is also produced by the reaction: HCl + OH yields Cl + water. Therefore, the O3 destruction by natural levels of HCl should be taken into consideration for the evaluation of O3 destruction by Freon. Based on the data for Freon, carbon tetrachloride, and methyl chloride concentrations measured in 1973-1974, the formation rate of various types of chlorides in the stratosphere and troposphere were calculated. The formation rate of Cl from Freon showed a peak at about 30 km altitude. The O3 destruction rate by the Cl-Cl0 cycle showed a peak at 30-40 km, which corresponded to about 10-15% of the total O3 destruction rate in the stratosphere.

56232 **APTIC NO. 79930**

Otsuka, Yukio, Takao Ohashi, Yoshinori Katagiri, Tsuneto Koyama, Tomio Matsumura, and Shigeru Miyazak

EFFECTIVE FACTORS ON RAINFALL COMPONENTS. *Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):451, 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., 3p (Presented at the National Conference on Air Pollution, 16th, Japan Paper 327.)*

The possible correlation between data on components of rainwater in December, 1974 and those obtained by regular observation of air pollution was investigated. Rainwater was collected in a glass collector on the roof of a building. Formaldehyde, pH, sulfate, nitrate, and chlorine ion were measured separately for the first millimeter of rainfall and the remainder of the rainfall. Data on oxidants obtained nearby was used. Weather data were also collected. There is some correlation between HCHO, nitrate, sulfate, and oxygen and ozone concentrations in the first millimete of rainfall and in the atmosphere, but there is little correlation among the other components. The fact that the concentration of oxidants, which are not directly related to rainfall, correlates with the components in rainwater is probably because oxidants have become widely spread pollutants covering a large area. The product of photochemical reactions may have some influence on the component of rainwater.

56233 **APTIC NO. 76127**

Pagliardini, A. and M. Plissier

DISCUSSION OF ATMOSPHERIC POLLUTION BY PHOTOCHEMICAL SMOG. *(Mise au point sur la pollution atmospherique par le brouillard photochimique). Preprint, 13p., 1975. Translated from French, 13p.*

Possible connections for the formation of photochemical smog in Nice were studied. Ozone and nitric oxide concentrations were measured with chemiluminescence analyzers, and hydrocarbons by chromatography. Meteorological data were provided by the Center of Nice-Airport of Cote d Azur. Measurements were taken from the sidewalk of a busy street facing the sea. Measurements were also taken from a rural hill in Nice for comparison. The daily variations of the chemical and meteorological parameters are presented graphically. The chemical data are discussed. The stability of the atmospheric layers allows preliminary substances to accumulate during the night, causing considerable formation of ozone and a light oxidizing smog. Smog formation is possible from April to September. It is limited by the relatively high humidity prevailing most of the time in the Nice area: the aerosols favored by the closeness of the sea partly destroy the ozone produced through hydrolysis. This explains the small number of ozone concentration values that approach the serious risk level for oxidizing smog (0.1 ppm), and thus the absence of harmful effects.

56234 **APTIC NO. 80444**

Pendergast, M. M. and T. V. Crawford

ACTUAL STANDARD DEVIATIONS OF VERTICAL AND HORIZONTAL WIND DIRECTION COMPARED TO ESTIMATES FROM OTHER MEASUREMENTS. *In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. Du Pont de Nemours (E. I.) and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, p. 1-1-1-14, June 1975. 6 refs. (Presented at the Symposium on Atmospheric Diffusion and Air Pollution, Santa Barbara, Calif., Sept. 9-13, 1974.)*

NTIS: DP-1374

Meteorological data were used to assess the applicability of several techniques used to determine the standard deviations for horizontal and vertical wind directions. The magnitudes of these standard deviations are used for determining coefficients for the calculations of downwind concentrations of airborne contaminants. A comparison of the frequency distributions of the dilution factor led to the following conclusions: a curve based on the direct measurement of the standard deviations for horizontal and vertical wind directions is assumed to provide the best estimate; frequency distributions calculated by different methods vary greatly, with the variations being particularly evident at high cumulative probabilities; large variations occur as a result of the choice of layers over which vertical temperature measurements are obtained. (Author conclusions modified)

56235 **APTIC NO. 80446**

Pendergast, M. M. and J. F. Schubert

AERODYNAMIC FYLING OF BIVANE WIND DIRECTION INDICATORS. *In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. Du Pont de Nemours (E. I.) and Co., Aiken, S. C., Savannah River Lab., Engery Research and Development Administration Contract AT(07-2)-1, p. 2-1-2-5, June 1975.*

NTIS: DP-1374

The accuracy of verticial elevation angle measurements made with bivane wind direction indicators was investigated. Accurate measurements of the vertical elevation angle are important to the development of estimates of vertical fluxes within the planetary boundary layer and in turn to the modeling of pollution transport and diffusion. Wind tunnel experiments indicated that the advertised accuracy of a Climet bivane system (+ or - 1 deg for the elevation angle) does not take into account the variability due to aerodynamic lift as the result of tail orientation. Even after the direction translator is mounted in a vertical position, flying of the tail can cause an offset of as much as 3 deg in the elevation angle. Field tests indicate that as the tail becomes weathered and starts to deteriorate the changed dynamic characteristics can cause additional errors.

56236 **APTIC NO. 80448**

Pendergast, M. M. and B. Gottlieb

EVALUATION OF DIFFERENT METHODS OF ESTIMATING VERTICAL EDDY DIFFUSIVITIES FROM TV TOWER DATA. *In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. Du Pont de Nemours (E. I.) and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, p. 3-1-3-10, June 1975. 3 refs.*

NTIS: DP-1374

Meteorological data collected from a television tower were used to determine the value of the vertical eddy transfer coefficient and the value of the vertical exchange coefficient for momentum. The successful application of the conduction equation for describing the diffusion of atmospheric constituents in the vertical direction is dependent on the selection of values for the vertical eddy transfer coefficient. Most of the calculated values for the vertical exchange coefficient for momentum were within 10,000 and 1,000,000 sq cm/sec, a range which is in agreement with previous investigators findings. Profiles showed a general increase with height up to 200 m during late morning and early afternoon. Scatter of points was greatest during the hours 1000-1600, coinciding with the largest expected value for the vertical exchange coefficient for momentum. Values for the vertical exchange coefficient for heat were also calculated.

56237 **APTIC NO. 80449**

Pendergast, M. M.

VERIFICATION OF SRL BUOYANT PLUME CALCULATIONAL PROCEDURES THROUGH USE OF MEASURED SO2. *In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. Du Pont de Nemours (E. I.) and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, p. 5-1-5-12, June 1975. 5 refs.*

NTIS: DP-1374

Atmospheric sulfur dioxide measurements were performed to verify predictions of SO2 concentration made with buoyant plume calculational procedures. The expectation that a Gaussian plume equation can produce reasonable results with respect to the frequency distribution of pollutant concentrations was substantiated. Little difference between different methods was apparent from an examination of the concentration frequency distributions. Gaussian plume models showed best agreement with measured values of SO2 for distances between 2 and 10 km from the source. These simple models were ineffective, however, for calculating concentrations at a particular point in time. The major difficulty was the improper selection of plume orientation. Interference from other sources of SO2 was also significant. (Author conclusions modified)

56238 **APTIC NO. 80873**

Pendergast, M. M.

A SIMPLE MODEL USED TO DETERMINE DOWNWIND CONCENTRATIONS RESULTING FROM EITHER CONTINUOUS OR INSTANTANEOUS RELEASES USING METEOROLOGICAL OBSERVATIONS FROM A SINGLE TOWER. *In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. Du Pont de Nemours (E.*

I.) and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, p. 7-1-7-6, June 1975. 9 refs.

NTIS: DP-1374

A computerized model for determining downwind concentrations of pollutants resulting from either continuous or instantaneous releases is developed using meteorological observations from a single tower. The computer code considers the cloud to be a puff for the short duration case, while for the continuous release case the cloud is assumed to resemble a continuous plume. Refinements that might be applied to the model include the inclusion of topography, deposition velocity, and rainout or precipitation scavenging, the allowance for a curved trajectory, and the incorporation of a radioactive decay function. The model is fast, easy to use, and requires less than 3000 bytes of computer storage.

56239 **APTIC NO. 80525**

Ramanathan, V.

GREENHOUSE EFFECT DUE TO CHLOROFLUOROCARBONS: CLIMATIC IMPLICATIONS. *Science, 190(4209):50-52, Oct. 3, 1975. 18 refs.*

The impact on the overall thermal energy balance of the earths atmospheric system due to a significant build up in the concentrations of chlorofluorocarbons and chlorocarbons was calculated. The infrared bands of chlorofluorocarbons and chlorocarbons enhance the atmospheric greenhouse effect. This enhancement may lead to an appreciable increase in the global surface temperature if the atmospheric concentrations of these compounds reach values of the order of 2 ppb. Such a concentration of chlorofluorocarbons is expected to be reached by the year 2000 if the present level of injection is maintained. (Author abstract modified)

56240 **APTIC NO. 73640**

Robinson, G. D.

PHYSICAL CAUSES AND POSSIBILITIES OF CLIMATIC CHANGE. *Preprint, Center for the Environment and Man, Inc., Hartford, Conn., 15p., 1975. 3 refs. (Presented at the Atmospheric Quality and Climatic Change Symp., Chapel Hill, N. C., March 20-21, 1975.)*

Factors affecting the earth s climate are discussed, with particular emphasis on anthropogenic activities. The burning of fossil fuel over the last century appears to have increased the carbon dioxide content of the whole atmosphere by about 10%. An increase in the opacity of the lower atmosphere to thermal radiation and an increased surface temperature are the results of this massive change. If the trend continues, the picture of the planet s future is that of increasing surface temperature which in turn liberates more CO2 from the oceans and also increases the atmospheric water vapor content. These effects are described as the runaway greenhouse. A second potential mechanism of global climatic change by man is an increase of planetary albedo following an increase of particle content of atmosphere. The type of effect of particles on global albedo depends on the position of its characteristic point relative to a line whose position and slope characterize surface albedo. Most particles over an ocean increase the global albedo, while those over snow, ice, or clouds increase the global albedo. Although the effect of particles on global climate is marginal, local climates can be substantially affected since particles increase atmospheric opacity to terrestrial radiation, thus augmenting the greenhouse effect. A calculation of the net energy transformation at the earth s surface resulting from the burning of a quantity of sulfur-bearing coal indicates that the solar energy which is prevented from reaching the ground exceeds the calorific value of the coal, assuming that only large particle collection is employed in the fuel burning process.

56241 **APTIC NO. 80737**

Saito, Tetsushi and Hisao Ota

UPPER ATMOSPHERIC WIND MECHANISM AND HIGH OXIDANT CONCENTRATION. *(Jyosofu no kozo to okishidanto konodo). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 98, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

The mechanism of high oxidant concentration occurrence (above 0.15 ppm) in the Ichihara area in Chiba Prefecture was investigated based on the variation of upper atmospheric wind structure. Data on wind direction and wind velocity measured at every 100 m in altitude using pilot balloons during the period of April to Oct. in 1971, 1972 and 1973 were analyzed. During the period of 12:00-14:00 with the highest frequency of high oxidants concentration, the triple wind structure of NW-SW-SE was clearly observed. In the case of quasi-high oxidants concentration (0.10-0.14 ppm), the triple wind structure was not definite. At the time of high Ox concentration, the frequency of SE and SW wind directions was increased, while that of NE and NW wind directions was decreased.

56242 **APTIC NO. 80511**

Samson, Perry J., Garry Neighmond, and Andrew J. Yencha

THE TRANSPORT OF SUSPENDED PARTICULATES AS A FUNCTION OF WIND DIRECTION AND ATMOSPHERIC CONDITIONS. *J. Air Pollution Control Assoc., 25(12):1232-1237, Dec. 1975. 13 refs.*

A linear regression analysis of high volume air sampler data and various meteorological parameters was used to determine a suspended particulate air pollution climatology for Albany, N. Y. A new method for exhibiting associations between wind direction and pollutant levels using correlation coefficients is presented. Correlations between wind direction distribution frequency and other meteorological parameters were employed to help explain differences in correlations for direction with suspended particulate levels. High particulate concentrations correlated well with southerly wind flow throughout the study area, regardless of the location of the receptor relative to local sources. Ambient background concentrations inherent in different air masses more consistently affected suspended particulate levels than did the diffusion from local sources. Maximum particulate advection occurred under conditions of good mixing of the boundary layer and moderate wind speeds and was enhanced further in the absence of removal processes such as rainout and washout. There was a definite relationship between path and origin of the wind flow and regional average particulate concentration. (Author abstract modified)

56243 **APTIC NO. 79962**

Sazanami, Hidehiko, Takeshi Kurokawa, Yoshio Kumagai, Hideaki Yoshioka, Toshihiro Kakimoto, and Kiyoshi Kayama

RESEARCH AND DEVELOPMENT OF MODEL OF URBAN ENVIRONMENTAL PLANNING. *(Shigaichi kankyo seigyo giho no kenkyu kaihatsu). Text in Japanese. Fujitsu, 26(5):683-691, 1975. 4 refs.*

Computer simulations of air and water pollution, developed in terms of causal chain mechanisms, are described. The air pollution model developed in 1973, was for a city located on a plain, with uniform winds. In 1974 the model was modified in two ways: the area under study was divided into blocks, and altitude changes in the area wer taken into account by defining wind direction and speed in each block; and the distance of flow of the plume centerline varied with changes in altitude. With the modifications, calculated and observed concentrations for nitrogen oxides better for data from A City. The water pollution model simulates a situation where pollutants generated by various urban activities are exhausted into a river, and are subjected to self-purification. Pollutant concentrations were measured at various points in the river. This model was divided into two submodels: one to calculate the quantity of pollution load; and a second to calculate the quantity of water. The biological oxygen demand (BOD) concentrations were calculated for B City, based on the above model, and its spatial distribution was found useful in overseeing sewage line system construction. A 5-year study, beginning in 1975, is planned to include other pollution problems.

56244 **APTIC NO. 80447**

Schubert, J. F.

A CLIMATOLOGY OF THE MIXED LAYER USING ACOUSTIC METHODS. *In: Savannah River Laboratory Environmental Transport and Effects Research. Annual Report - 1974. Du Pont de Nemours (E. I.) and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, p. 4-1-4-10, June 1975. 4 refs. (Presented at the Meteorological Observations and Instrumentations Symposium, 3rd, Washington, D. C., Feb. 10-13, 1975.)*

NTIS: DP-1374

Field experiments using acoustic sounders to obtain information on the structure of the atmospheric mixed layer were performed at two different sites. The experiments demonstrated that the method has potential for remote sensing of the mixed layer and that a statistical climatology of the atmospheric boundary layer can be built. Calculated maximum mixed heights were much higher than those depicted by the sounder; one cause for this discrepancy was the lack of sensitivity of the system for identifying the height of the tops of thermal plumes when there was no capping inversion. This difference between calculated and measured heights can result in significant discrepancies between actual and predicted concentrations of air pollutants. (Author conclusions modified)

56245 **APTIC NO. 80862**

Shum, Y. S., W. D. Loveland, and E. W. Hewson

THE USE OF ARTIFICIAL ACTIVABLE TRACE ELEMENTS TO MONITOR POLLUTANT SOURCE STRENGTHS AND DISPERSAL PATTERNS. *Oregon State Univ., Corvallis, Radiation Center and Dept. of Atmospheric Sciences, Energy Research and Development Administration Contract, 25p., 1975. 13 refs.*

NTIS: RLO-2227-T7-28

A tracer technique using rare earth elements such as dysprosium, samarium, lanthanum, and cerium was developed to monitor pollutant source strengths and dispersal patterns. The technique was applied to determine whether available meteorological dispersion models can be used effectively to monitor pollutant emissions from selected industries in the vicinity of Albany, Oregon. A Gaussian plume model was satisfactory for moderately intense turbulence fields which characterize stability types B, C, and D, including cases in which the pollution is trapped by an inversion layer aloft. It was necessary to make allowance for urban influences on plume dispersion for lower sources, however. A box model best described the observed dispersal pattern when the upward penetration of the very intense turbulence of stability type A was limited by an inversion layer aloft. These meteorological models in combination with multiple regression analysis were used to predict the rate of emission for multiple sources consisting of three stacks within a factor of two. The tracer technique appears capable of being extended to locate unknown or unsuspected sources of air pollution by using activable trace elements which naturally occur in a stack effluent. (Author abstract modified)

56246 **APTIC NO. 73575**

Stephens, N. Thomas, J. Martin Hughes, Erik S. Hougland, and John Salop

URBAN-INDUSTRIAL AIR POLLUTION DISPERSION. A CASE STUDY. *Preprint, Virginia Polytechnic and State Univ., Blacksburg, Dept. of Civil Engineering and Region VI Virginia State Air Pollution Control Board, Virginia Beach, 16p., 1975. 6 refs. (Presented at the Environmental Engineering and Science Conference, 5th Annual, Louisville, Ky., March 3-4, 1975.)*

The application of the Air Quality Display Model to the prediction of the spatial distribution of annual average and maximum 24-hour concentrations of particulates and sulfur dioxide in the Norfolk, Virginia area is described. The model uses a mathematical simulation of the atmospheric diffusion process in the urban-industrialized area under investigation. Emissions, meteorological, and monitoring data for the baseline year 1972 are used for model validation and calibration purposes. Particulate matter and SO2 concentration values are computed for 392 selected and grid point intersection receptor locations in order to define the boundaries or areas of influence of major sources and indicate potential problem areas. Another useful output of the program is a table listing the percentage contribution of all sources to five maximum value receptors. The prediction of the spatial distribution of SO2 and particulates for future years is achieved using revised emission inventories for both point and area sources to reflect growth and/or change in source distributions. Predicted values for 1975 indicate that the general control plan for the area will be effective, although some more refined strategies will be necessary to bring about full compliance with standards in all locations.

56247 **APTIC NO. 80986**

Subbarao, Maddukuri China and Phanindramohan Das

MICROPHYSICAL IMPLICATIONS OF PRECIPITATION FORMATION IN AN ADIABATIC VERTICAL CURRENT: AEROSOL SCAVENGING BY ENHANCED NUCLEATION. *J. Atmospheric Sci., 32(12):2338-2357, Dec. 1975. 33 refs.*

The time-dependent effect of precipitation formation and development on the dynamics and microphysics of adiabatic vertical motion was studied using one-dimensional numerical models. In an updraft, with developing precipitation, a progressive development of supersaturation and the consequent activation of fresh nuclei is an essential requirement for maintaining the updraft in its approximately adiabatic state. A precipitating cumulus can scavenge aerosol particles effectively by first activating them to form droplets and then removing the latter in the form of precipitation. Within the restrictions of the model, the downdraft driven by precipitation is unsaturated. Within the restrictions of the model the downdraft is also warmer than the environment except when very close to the ground, where evaporative cooling causes a slight temperature break. (Author abstract modified)

56248 **APTIC NO. 73421**

Suzuki, Masaaki, Yoshio Saiki, Koji Nagami, and Saburo Sugano

REGIONAL ENVIRONMENTAL POLLUTION CAUSED BY OZONE AND OXIDANT AT ISEHARA AREA. *(Isehara chiku no ozon, okishidanto ni yoru chiiki osen). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:37, Feb. 1975.*

Both ozone and oxidant levels at two locations in Isehara city (Kanagawa Prefecture) were measured from August 12 to September 30, 1973. The average oxidant concentrations found in these locations were 0.05 ppm and 0.04 ppm. A higher oxidant level occurred when a southerly wind was blowing. The measured ozone contributed 75% to the measured oxidant level, and the correlation between oxidant and ozone levels was 0.97. The periodicity of peak oxidant level was every 8 days, which coincided with the 8 day periodicity of the strongest southerly wind.

56249 **APTIC NO. 80850**

Unger, Charles

CLIMATE OF THE NORTH CENTRAL COAST AIR BASIN. California Air Resources Board, Sacramento, Div. of Technical Services, 22p., July 1975. 14 refs.

The climate of California s North Central Coast Air Basin is reviewed with particular emphasis on the meteorological aspects of air pollution potential. The terrain of the basin consists of two major valleys and four ranges of mountains. Air entering the upper Pajaro River Valley from the Bay Area is extensively modified as it moves up the Santa Clara Valley. The climatology of the surface temperature in the basin, which is influenced by terrain features, exerts considerable influence on ventilation, particularly during the summer months when the gradients of afternoon temperatures can be very large. Mean morning wind speeds in the mixing layer range from 4.6-4.9 m/sec.

56250 **APTIC NO. 73420**

Wakamatsu, Shinji, Yoshio Saiki, Koji Nagami, and Sabur Sugano

DISTRIBUTION OF ATMOSPHERIC POLLUTANT BY ALTITUDE. *(Taiki osen no kodo betsu nodo bunpu chosa). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:38, Feb. 1975.*

The atmospheric distribution of ozone was measured in Kanagawa Prefecture from June through August using a helicopter, pilot balloon, and non-lift balloon. The ozone concentration at higher altitude increased with increasing ozone concentration at ground level when a sea wind blew. Although the appearance of highest ozone levels depended upon the wind velocity, time of occurrence of sea wind, atmospheric temperature, and strength of sunlight, the most important factor was when the sea wind started. A high level of ozone in a larger area tended to occur and persist when the sea wind started blowing around noon. No apparent regional difference in the horizontal ozone concentration at 300 m altitude was observed, but the northern part of Kawasaki city tended to have higher ozone levels at this altitude than other areas when the sea wind blew.

56251 **APTIC NO. 79839**

Zeldin, Melvin D. and Donald M. Thomas

OZONE TRENDS IN THE EASTERN LOS ANGELES BASIN CORRECTED FOR METEOROLOGICAL VARIATIONS. *Preprint, San Bernadino County Air Pollution Control District, Calif., 5p., 1975. 5 refs. (Presented at the Environmental Sensing and Assessment, Conf., Las Vegas, Nev. Sept. 14-19, 1975.)*

A meteorological point-classification model of ozone prediction which allows for quantifying the meteorological conditions and subsequent correction of ozone trends in the Eastern Los Angeles Basin is described. Ozone prediction for the Eastern Los Angeles Basin areas is based on the premise that primary ozone precursors originate in the populous Los Angeles-Orange County metropolitan areas in the morning hours and are then transported northward and eastward. The photochemical processes continue during the daytime seabreeze transport phenomenon, reaching the eastern Basin areas with peak ozone values late in the afternoon. The model indicates that improving conditions are occurring from a south-to-north direction, with the peak ozone degradation moving off to the north. The predicted values for the number of equivalent hours when ozone concentrations were over 0.20 ppm were 256, 223, and 185 hr for San Bernardino, Redlands, and Riverside, respectively. The actual 1975 values were: 253, 225, and 182 hr, respectively.

56252 **APTIC NO. 73295**

PHOTOCHEMICAL SMOG AND METEOROLOGICAL CONDITIONS. *(Kokagaku sumogu to kisho joken). Text in Japanese. Kankyo Hoken Reporto (Environ Health Rept.), no. 34:21-34, March 1975.*

The oxidants level as photochemical smog is related to meteorological conditions for the Tokyo area. High oxidant levels appear with increased sunlight; however, when the quantity exceeds more than 60 cal/sq cm hr, thus increasing the atmospheric temperature difference between inland area and ocean area, the oxidant level decreases because of the increasing sea wind which dilutes primary pollutants as well as oxidants. High oxidant levels appear during June through August more than during the winter period, which is attributable to the atmospheric temperature. Higher oxidant levels appear when the temperature is between 21.5 to 27 C, but atmospheric temperatures above 27 C decrease the frequency of high oxidant level appearance due to the stimulation of sea wind with higher temperature. Increased wind velocity generally decreases the observed atmospheric oxidant level, however unexpected high oxidant levels can appear at unexpected places due to primary pollutants forming photochemical oxidants during their transport. Atmospheric stability also affects the oxidant level, and higher oxidant levels appear when an inversion layer is present above the mixing layer. The daily peak oxidant level generally appears between 12 pm to 3 pm; however, the peak appears as early as 10 am and as late as 5 pm when rain fronts are near the area.

56253 **APTIC NO. 73591**

California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab.

RESUSPENSION OF PARTICULATES. *In: Annual Report of the Biomedical and Environmental Research Program of the LASL Health Division. Energy Research and Development Administration Contract W-7405-ENG. 36, Rept. UC-48, p. 27-29, Feb. 1975. 1 ref.*

NTIS: LA-5883-PR

Wind tunnel studies of the resuspension of particulates were conducted to obtain information useful for predicting the probable spread or migration of surface contaminants. The resuspension velocity varied inversely with the particle size for initial studies with single glass spheres. A cumulative plot of the fraction of particles resuspended as a function of velocity gave a non-linear curve; a similar relationship was obtained when the resuspended fraction of a dispersion of monodisperse particles was plotted against mean center-line velocity. Increasing the velocity immediately resulted in an additional fraction of the particles being resuspended, although maintaining the velocity for a prolonged period did not markedly increase the resuspended fraction. When particles of different sizes were mixed to give volume median diameters similar to the diameters of monodisperse particles, lower velocities were required to resuspend the same fraction of particles, indicating that the mechanical impact between particles in addition to flow field distortions was an important mechanism in resuspension. The fraction of material moved or resuspended by creep was normally distributed with respect to the natural logarithm of mean center- line velocity. Thee largest fraction of mass transport occurred at creep flow of saltation close to the surface. Interactions that occur between particles in this region may also be responsible for generation and resuspension of small particles with significant lifetimes in air.

56254 **APTIC NO. 80645**

Energy and Environmental Analysis, Inc., Arlington, Va. and AVRAM Co., Falls Church, Va.

APPENDIX 4. SULFATE EXPOSURE MODELS. *In: An Analysis of the Automotive Sulfate Question, Manufacturers of Emission Controls Association Contract, 41p., 1975. 23 refs.*

The capability of various current models to predict the concentration of airborne sulfates due to emissions from catalyst-equipped automobiles is reviewed. Models used by the Environmental Protection Agency in the Issue Paper overpredict expected sulfate concentrations and lack validation with actual automotive sulfate measurements. The lead surrogate model appears to be the best method for exposure estimation at present since lead and sulfates exhibit similar emission patterns and both are particulates. The carbon monoxide surrogate model may also prove adequate since it too reflects real pollutant levels, but the level of conservatism due to assuming that sulfates are inert and gaseous cannot be currentl, assessed. (Author summary modified)

56255 **APTIC NO. 80765**

Environment Agency, Air Quality Bureau

MANUAL OF TOTAL EMISSION REGULATION. *(Soryo kisei manyuaru). Text in Japanese. 138p., 1975.*

Air pollution prediction methods and equations for total emission calculations are described. Data on emission sources, including location, height and diameter of stack, the kind and scale of smoke, as well as fuel data are used for model calculations. Point sources are preferred for diffusion simulation, although area sources can also be used when a number of point sources are concentrated in a small area. The Bosanquet equation is used to evaluate the smoke height when wind velocity is below 6 m/s, while at high wind velocities, the Moses and Carson equation can be used for large scale emissions and the Concawe equation for small and medium scale emissions. Plume equations and Puff diffusion models are used for the diffusion calculation for point source emissions at wind velocities above and below 1 m/s, respectively. Wind tunnel experiments are usually carried out for special meteorological conditions under which high pollution concentrations occur. Geometric simulation by the wind tunnel of the field situation is important. Equations for total emissions calculation are generally established based on fuel consumption and ground concentration.

1974

56256 **APTIC NO. 73530**

Auer, August H., Jr.

CUMULUS CONGESTUS GROWTH DOWNWIND OF ST. LOUIS, MISSOURI: CASE STUDY. *J. Weather Mod., 6(1):229-237, April 1974. 9 refs.*

A case of cumulus cloud growth downwind of St. Louis, Missouri observed during the Metropolitan Meteorological Experiment (METROMEX) in 1973 is described. After a weak maritime cold front passed through the metropolitan area, a growing line of cumulus congestus clouds in the downwind plume from the metropolitan area was observed. The urban effluent appeared to be ingested by the downwind cumulus clouds since these clouds were observed to carry boundary layer signatures, i.e., odors from surface industries and values of Aitken nuclei concentrations found only within the downwind well-mixed layer. A sample cloud developed precipitation size particles within 30 min of their initiation. Cloud top temperatures were never colder than 6 C, suggesting coalescence as the mechanism of precipitation formation.

56257 **APTIC NO. 80783**

Hary, E. and F. Roessler

PARTICLE DISTRIBUTION IN NOCTILUCENT CLOUDS. *Beitr. Physik Atmosphaere, 47(4):261-268, 1974. 9 refs.*

The aerosol particle size distribution in the layer of notilucent clouds was evaluated from rocket measurements of the sky radiance. The interpretation of the results of the measurements had to be based upon the model of a bimodal size distribution with two different radius ranges. The plausibility of this assumption was proved. The comparison of the particle numbers above, within, and underneath the noctilucent clouds showed characteristic differences of the two particle groups.

56258 **APTIC NO. 73642**

Briggs, Gary A.

THEORETICAL ESTIMATES OF LIFT-OFF OF BUOYANT GAS INITIALLY ON THE GROUND. *In: Environmental Research Laboratories 1973 Annual Report. National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. ATDL-106, p. 301-310, Dec. 1974. 5 refs.*

Mathematical methods for estimating the lift-off parameter of buoyant gas initially on the ground are presented along with some predicted consequences. One way to estimate the lift-off parameter is to compare the hydrodynamic pressure difference developed within the gas with the pressure of the turbulent velocity fluctuations. Only the lateral fluctuations are important for a continuous plume, whereas for a puff longitudinal fluctuations must be considered. Another method of estimating the lift-off parameter is to compare the lateral inward velocity developed through the bottom half of the cloud with the outward diffusive velocity from plume theory. Whatever the true value of the critical lift-off parameter, this estimate is essentially for a continuous point source (a plume). For an instantaneous point source (a puff), the critical value is probably about 50% higher due to more diffuse inflow. For an instantaneous line source perpendicular to the wind, it may be about 50% higher due to more vigorous longitudinal than lateral turbulence. An instantaneous source parallel to the wind is equivalent to a continuous point source in a crosswind. The lift-off parameter is constant for sources with growing buoyancy, and there is a critical wind speed for the continuous point source and the instantaneous line source. For an instantaneous puff, lift off occurs before transition or not at all. The continuous line source always lifts off eventually unless the top of the plume is restricted by stable air aloft by the time the lift-off parameter is sufficiently large. Empirical studies are needed to establish critical values necessary for lift-off.

56259 **APTIC NO. 80406**

Crawford, T. V., R. E. Cooper, M. M. Pendergast, and E. L. Wilhite

PROGRESS REPORT DOSE-TO-MAN PROGRAM. *E. I. du Pont de Nemours Co., Aiken, S. C., Savannah River Lab., Atomic Energy Commission Contract AT(07-2)-1, Rept. UC-11, 90., Jan. 1974.*

NTIS: DP-1341

A discussion is presented of a new meteorological data acquisition program now in operation using a 1200 ft tower located near the Savannah River Plant site. Previously collected meteorological data from the tower have been analyzed to show spatial and temporal variation in eddy diffusivity, mesoscale kinetic energy spectra, and dispersion climatology based upon wind sequencing information. A framework for calculation of dose-to-man is discussed, and the Brookhaven National Laboratory and Pasquill methods for determining dispersion coefficients are compared. A current sulfur dioxide survey is discussed which will help verify the calculation techniques for predicting dispersion from heated plumes. (Author abstract modified)

56260 **APTIC NO. 73523**

Dirks, Richard A.

URBAN MODIFICATION OF HEAT AND MOISTURE FIELDS. *Preprint, Wyoming Univ., Laramie, 4p., 1974. 9 refs. (Presented at the Conference on Weather Modification, 4th, Fort Lauderdale, Fla., 1974.)*

Field studies of heat and moisture fields in the urban industrial St. Louis area were made during the months of August 1971-1974. The anomaly fields of heat and moisture extended to considerable heights during deep mixing, and the mid-afternoon situation of August 10, 1972 showed potential temperature increases greater than 1.0 C and moisture deficits exceeding 0.5 k/kg at both 300 m MSL and 850 m MSL. Well defined ambient winds caused the anamalous fields to correspondingly shift in the downwind direction, yielding a plume-like pattern. Moderate to strong winds considerably reduced the magnitude of the temperature and humidity anomalies. The results suggest qualitative differences in the rural-urban moisture and energy budgets.

56261 **APTIC NO. 80631**

Duce, A., G. Quinn, and L. Wade

RESIDENCE TIME OF NON-METHANE HYDROCARBONS IN THE ATMOSPHERE. *Mar. Pollut. Bull., 5(4):59-61, April 1974. 13 refs.*

Data on the global production and concentration of atmospheric non-methane hydrocarbons in non-urban areas are used to estimate the atmospheric residence time of these substances. The mean residence time of long-lived non-methane gaseous hydrocarbons is estimated to be between 0.5 and 2.3 yr. The residence time estimates are mean values for all hydrocarbons which are not converted to particles; differences exist in the residence times of individual hydrocarbon classes and class members.

56262 **APTIC NO. 73188**

Esaka, S., K. Sakoda, T. Sawa, and M. Oki

CHARACTERISTICS OF PHOTOCHEMICAL AIR-POLLUTION IN KYOTO REGION. *(Kyoto-fu ni okeru kokagaku osen no tokucho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):559, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 406.)*

Characteristics of oxidant pollution in Kyoto Prefecture were analyzed. The oxidant concentration distribution was classified into three patterns: (1) local pollution in the southwestern area, (2) pollution in the eastern area, and (3) pollution covering the entire (including Kyoto city) southern area. The frequency of occurrence was in the order of (1), (2) and (3). Photochemical pollution in the southern area was closely related to SW surface wind, and pollutants were transported from the Osaka bay area by SW wind. The time of maximum oxidant concentration corresponded to wind velocity of SW wind from Osaka bay. The diurnal variation in oxidant concentration showed a peak at 1:00-3:00 pm, and high concentration was often maintained until sundown. The high oxidant concentration was widespread rather than localized. The supremum curve of maximum values of nitrogen oxides and oxidant concentrations at 6:00-9:00 am was higher than that in Tokyo. The oxidant concentration increased with altitude to a certain point. The oxidant pollution in Kyoto was attributable to pollutants transported from Osaka bay area.

56263 **APTIC NO. 73548**

Fortak, H. G.

MATHEMATICAL MODELLING OF URBAN POLLUTION. *Advan. Geophys., vol. 18B:159-172, 1974. 13 refs.*

Urban air pollution forecasting is discussed in terms of various mathematical model approaches. Gaussian-type models are advantageous in so far as the availability of empirical data on the dependence of the standard deviations from meteorological conditions is concerned. On the other hand, some skill is necessary to model the air pollution climatology of a city and to achieve good agreement between simulated and observed statistical properties of long-term air quality data. Although modeling urban air pollution on the basis of puff or plume models requires considerable computer time, the spectral approach allows for the possibility of controlling the space resolution of the fields and of introducing prescribed scales of analysis. It also provides for a connection with the results of stochastic dynamic weather forecasting. Methods of stochastic dynamic prediction based on diabatic models of the atmosphere are capable of providing statistical forecasts of meteorological parameters for regions as small as cities and for prediction ranges of about 1 or 2 days.

56264 **APTIC NO. 73403**

Funabashi, S., S. Shioya, H. Haruna, K. Hasegawa, and F. Miyamoto

ON-LINE PREDICTION OF PRIMARY AIR POLLUTION. *(Taiki no ichiji osen no onrain yosoku). Text in Japanese. Preprint, Japan Society of Automatic Control, Kyoto, p. 429-430, 1974. 6 refs. (Presented at the Japan Society of Automatic Control, 17th, Lecture Meeting, Kyoto, Japan, Nov. 21-23, 1974, Paper 3061.)*

Two methods of forecasting air pollution are described. Prediction of pollutant concentrations for a few hours in advance is effected by numerical forecasting (micro-pollution- concentration-distributions). Predictions for the next day, or regional predictions on the same day, are computed by category forecasting (macro-factors are utilized, such as production schedules and regional meteorological conditions). Simulations of urban pollution were based on the multi-layered box model. Care must be taken that numbers used in the calculations are representative, appropriate, and accurate. Comparison between calculated and observed values resulted in 78% accuracy for 1-hour forecasting (error of plus or minus 4 pphm), and 90% accuracy for same-day forecasting.

56265 **APTIC NO. 73234**

Georgii, H. W., D. Jost, R. S. Kaller, and J. Mueller

THE DEPENDENCE OF AIR CHEMICAL PARAMETERS ON METEOROLOGICAL CONDITIONS IN THE ST. MORITZ MOUNTAIN VALLEY. *(Ueber den Zusammenhang zwischen luftchemischen und meteorologischen Parametern im Hochtal von St. Moritz). Text in German. Arch. Meteorol. Geophys. Bioklimatol., Ser. B, 22(4):363-373, 1974. 10 refs.*

The diurnal fluctuation of chemical trace constituents such as sulfur dioxide, ozone, and oxides of nitrogen in the atmosphere of the Upper Engadine under the influence of the Maloja wind system was studied. Trace gases were measured in summer of 1972 at two stations, one in the valley in St. Moritz-Bad (1779 m above sea level) and one on the mountain Corviglia (2500 m above sea level). Meteorological measurements, particularly measurements of the Maloja wind, were taken in the summers of 1971 and 1972. The Maloja wind sets in at 1 pm, reaches highest speed between 2 and 4 pm, and disappears around 7 pm. The concentration characteristic of the trace gases shows a clear minimum overnight and a maximum during the day. The influence of the Maloja wind is illustrated by the diurnal fluctuation of the atmospheric SO2 concentration. On the morning of September 3, 1971, the measuring station St. Moritz-Bad was under the influence of the city of St. Moritz due to faint northeastern winds. During this time the SO2 concentration reached an absolute maximum. Around noon the Maloja wind set in, and the concentration dropped markedly. In the afternoon the concentration increased again with heavy Maloja winds and dropped to values near the detection limit in the evening. The concentration increase with strong Maloja winds can be explained by air pollution carried across from Italy which at low relative humidity disappears only very gradually. The oxides of nitrogen show the same diurnal fluctuation as sulfur dioxide. Ozone had the anticipated characteristic fluctuation with the maximum around noon at the time of strongest vertical mixing. The relationship of the diurnal fluctuations of these trace gases to the Aitken nuclei concentration and the relative humidity is discussed.

56266 **APTIC NO. 73585**

Gillett, James W., James Hill, IV, Alfred W. Jarvinen, and W. Peter Schoor

A CONCEPTUAL MODEL FOR THE MOVEMENT OF PESTICIDES THROUGH THE ENVIRONMENT: A

CONTRIBUTION OF THE EPA ALTERNATIVE CHEMICALS PROGRAM (FINAL REPORT). *Environmental Protection Agency, Corvallis, Oreg., National Ecological Research Lab., Proj. 1EA487, ROAP 21BCL, Task 03, Rept. EPA-660/3-74-024, 87p., Dec. 1974. 79 refs.* GPO

A multi-media model of the movement and disposition of pesticides in the environment is described. The model is built from simple modules representing basic processes and components of air, soil, and water. More specific models are established for atmospheric/terrestrial, freshwater aquatic, and estuarine/marine environments. Iterative operations of expansion and systematic reduction of the components and processes of the model are performed to join environmental segments to provide a holistic view of the disposition of a chemical and its attendant effects. Systems analysis and mathematical simulation can be employed to evaluate the fate of a specific chemical in a particular environment. The atmospheric/terrestrial model is directly applicable only to the agent being investigated; its breakdown products or metabolites are representable as parallel models.

56267 **APTIC NO. 73189**

Goi, K., S. Mogi, S. Imazeki, Y. Kobayashi, and S. Yuzawa

SOME FEATURES OF PHOTOCHEMICAL SMOG IN SAITAMA PREFECTURE. *(Saitama-ken ni okeru kokagaku sumoggu no tokucho. Dai-2-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):558, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 405.)*

Characteristics of oxidant concentration distribution and maximum oxidant concentration time in a fan-shaped area with its axis in the northwest direction and at a distance of 20 km to 70 km from Tokyo bay were analyzed based on the data of 25 high oxidant concentration days during the period of April to Aug. 1974. There were no cases of high oxidant concentration localized in the northern region, however, several cases of high oxidant concentration localized in the southern region were found. Oxidant concentration above 0.2 ppm was always accompanied by a 0.15 ppm block indicating the continuity of oxidant concentration distribution. The cumulative distribution indicated that the most frequent occurrence of oxidant above 0.15 ppm was concentrated in the elliptical area round Urawa city located 30 km northwest of Tokyo bay. The distributions in other areas were fairly even. The distribution of oxidant concentration above 0.20 ppm showed a similar pattern. The average time of maximum oxidant concentration was plotted against distance from Tokyo bay, which showed fairly definite linearity in each direction. The rate of progress was 4.0-5.5 m/sec, which was in fairly good agreement with the velocity of the southerly wind.

56268 **APTIC NO. 73208**

Hatano, S., S. Mochizuki, and T. Sekikawa

DETERMINATION OF RADON IN HACHIJO ISLAND. *(Hachijo-jima ni okeru radon nodo sokutei). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 12:63-66, 1974.*

As a part of studies on the atmospheric dispersion of aerosols from emission source, the radon concentration was measured on Hachijo island during the period of Feb. 3-17, 1974. The measurement was made every three hours by the filter method using an Aroka counter GM-5004 and Aroka TRM-1. The diurnal variation in Rn concentration is given with data on wind velocity, wind direction, weather, and trajectory. The results were analyzed in relation to meteorological conditions, which indicated that the origin of aerosol was on the land outside of Hachijo island. Higher concentrations measured on Feb. 16 and 17 were attributable to volcanic activity near Ioo island a few days earlier.

56269 **APTIC NO. 73233**

Hirano, Jinshi

TECHNIQUES OF ENVIRONMENTAL POLLUTION ESTIMATION. *(Kankyo osen yosoku gijutsu). Text in Japanese. Sangyo Kogai Boshi Gijutsu (Ind. Pollut. Control Tech.), 1974:37-39, June 1974.*

The results of experiment indicated that the structure of the atmospheric boundary layers on plain surfaces can be classified into 3 cases. The first case is the structure in which a strong convection current is present in the lower part and an inverted temperature zone is present in the upper layer. The second case is the structure in which the lower layer is neutral and an inverted layer is present in the upper part. The third case is the structure in which the whole layer is inverted. In the second case, the height of the boundary layer is proportional to the 1/3 order of the height. In the third case, the irregularity is inversely proportional to the wind velocity. Studies were made on the estimation of atmospheric pollution by numerical calculation. The equations proposed by Sutton, Smith, Roberts, and Sakagami are helpful. Physical and statistical models are also known. These are the box model, the plume model, and the puff model. These models are suited for particular cases. A number of data for forecasting smog have been accumulated. It was found, for example, that the presence of sulfur dioxide in an amount more than 0.05 ppm is effective to reduce the formation of ozone. Model experiments, simulating photochemical reactions, were made for a number of cases.

56270 **APTIC NO. 73579**

Huang, Chao-Ming, Robert W. Garber, Ozzie Huff, John W. Frey, and Thomas L. Montgomery

INVESTIGATION OF ATMOSPHERIC CHEMICAL INTERACTIONS IN COAL-FIRED POWER PLANT PLUMES. *Tennessee Valley Authority, Muscle Shoals, Ala., Air Quality Branch, Rept. E-AQ-74-1, 181p., May 1974. 81 refs.*

Atmospheric chemical interactions in coal-fired power plant plumes were investigated in three studies. The ground-level concentrations of sulfur dioxide, nitrogen dioxide, and atmospheric oxidants were monitored in the vicinity of four Tennessee Valley Authority (TVA) coal-fired power plants. The 1-hour average ground-level concentrations of SO_2 were usually below 0.1 ppm and those of NO_2 and oxidants were usually below 0.04 ppm. Airborne measurements were made of particle size distribution of particulates and the relative distribution of particulates and gases in the plume. There is a possibility of gravitational settling in the plume of particulates with diameters of 3 micron or larger. Airborne measurements were made of various plume constituents and meteorological parameters to provide some insight into the atmospheric interactions. Interactions among the various plume constituents occur to a significant extent. The semiquantitative agreement between experimental observations and theoretical derivations suggests that the chemical reactions in the proposed kinetic model might have occurred to a significant extent. This would indicate that in power plant plumes the fates of all species are interdependent, and that in the prediction of the concentration of any species, proper account must be taken of the effects exerted by other species and by meteorological conditions. The oxidation of SO_2 in the plume may not be considered an independent process. (Author summary modified)

56271 **APTIC NO. 73185**

Kawamura, T.

METEOROLOGICAL ANALYSIS ON PHOTOCHEMICAL AIR POLLUTION IN THE BROAD AREA OF KANTO PLAIN. *(Kanto heiya ni okeru kokagaku taiki osen no koiki kisho kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):563, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 412.)*

Meteorological conditions associated with high oxidant concentration in the Kanto area are discussed. In southern Kanto, conditions for high oxidant concentration development are maximum temperature above 24 C, at least 2 to 3 hr of insolation before 2:00 pm, presence of atmospheric stagnant layer below 850 mb, and wind velocity less than 4 m/sec or 5 m/sec (depending on the position of lid). In the case of high oxidant concentration development in northern Kanto as well as southern Kanto, the presence of a definite inversion layer or stagnant layer in the lower atmosphere and fairly strong southerly wind at midday are necessary conditions in addition to the above-mentioned meteorological conditions. In the case of strong southerly wind in the morning, high oxidant concentrations are observed only in far northern Kanto, since primary pollutants are transported to the north before undergoing photochemical reaction. For the development of high oxidant concentration covering southern to northern Kanto, the presence of low stagnant layer and sea breeze front in southern Kanto, where primary pollutants are accumulated in the morning, and fairly strong southerly wind in the afternoon, which transports primary and secondary pollutants to the north, are necessary conditions.

56272 **APTIC NO. 73381**

Kawamura, Takeshi

RECENT TREND OF AIR POLLUTION METEOROLOGY IN JAPAN. *(Wagakuni ni okeru taiki osen kisho no saikin no doko). Text in Japanese. Chigaku Zasshi (J. Geogr.), 83(3):30-39, March 1974. 24 refs.*

The general trend of air pollution in Japan has changed from dust pollution to sulfur dioxide with the conversion of fuel from coal to petroleum and is changing to oxidants in recent years. As the result of source control of pollution, the incidence of high SO2 concentration in major cities has become rare, and instead the incidence of photochemical smog formation by nitrogen oxides and hydrocarbons is increasing. The meteorological conditions closely associated with photochemical smog formation are defined in comparison with those compiled by the OECD (Organization for Economic Coordination and Development). One of the characteristics of the recent air pollution trend is the involvement of larger areas. The meteorological conditions, wind directions, land and sea breeze trajectory, and frontal position of sea breeze contributing to the spread of oxidant pollution in the Kanto area are discussed taking as an example a high oxidant pollution day and a diurnal model of local winds in the Tokyo Bay area. The effect of topographical conditions of small scale on pollutant concentration is discussed. In the case of pollutant sources at low altitudes such as the case of automotive exhaust emission, localized high carbon monoxide, NOx, and HC concentrations are often observed in the high traffic volume area or low ground. The effect of pollutant concentration on plants along the Agatsuma Skyline was investigated at 20 measuring points in relation to the local topography. The status of distant measurement of pollutant concentration by laser radar and correlation spectrometry using airplanes and helicopters, and the areal survey of pollutant distribution and diffusion by satellite or airplane photos are also discussed.

56273 **APTIC NO. 80696**

Kerker, Milton

STUDIES OF COLLOIDAL PARTICLES; SCAVENGING OF AEROSOL PARTICLES BY A FALLING MACROSCOPIC PARTICLE (FINAL REPORT). *Clarkson College of Technology, Potsdam, N. Y., Atomic Energy Commission Contract AT(11-1)-3257, 5p., 1974.*

NTIS: COO-3257-8

Collection efficiencies of falling water drops (0.094-0.254 cm in radius) for silver chloride aerosol particles in nitrogen (0.15-0.6 micron in radius) wer measured. The drops accelerated for distances ranging from 30-515 cm prior to entrance into a scavenging chamber. The results were extrapolated to terminal velocity. The data for slower moving drops (30 cm acceleration distance) agreed roughly with predictions of a theory based on collection by Brownian diffusion. However, Brownian diffusion theory did not account for the results obtained near terminal velocity. Instead, the collection efficiency was a sharply increasing function of the impaction parameter for each value of particle radius. Washout coefficient calculations indicated that the half-life of 0.1-micron aerosol particles is about 1 day for moderate rainfall rates. This result, however, is strongly dependent on the particular raindrop size distribution. (Author abstract modified)

56274 **APTIC NO. 80632**

Kern, C. D.

A SIMPLE MODEL TO DETERMINE MESOSCALE TRANSPORT OF AIRBORNE POLLUTANTS. *Preprint, American Meteorological Society, Boston, Mass., p. 362-367. 5 refs. (Presented at the Atmospheric Diffusion and Air Pollution Symposium, Santa Barbara, Calif., Sept. 9-13, 1974.)*

Several simple models are used to predict the concentration of tritium transported from a nuclear materials plant, and the results are compared with actual observations of tritium concentrations downwind of the source. For conditions involving daytime heating from below a well mixed layer, a dry Lavoie model provides results equal to or better than persistence and better than a straight-line plume. With a better formulation of drag coefficients and topography, the dry Lavoie model is expected to aid in achieving the goal of taking good macroscale data and scanty mesoscale data to develop a better model of mesoscale motion over the entire region of a grid. (Author conclusions modified)

56275 **APTIC NO. 73246**

Kurihara, Masaki, Taro Shimogo, and Tatsuo Kurihara

STATISTICAL PREDICTION OF ATMOSPHERIC OXIDANT CONCENTRATION. *(Taiki osen okishidanto nodo no tokeiteki yosoku). Text in Japanese. Preprint, Japan Society of Automatic Control, Kyoto, p. 433-434, 1974. 1 ref. (Presented at the Japan Society of Automatic Control, 17th Lecture Meeting, Kyoto, Japan, Nov. 21-23, 1974.)*

Prediction of oxidants concentration by statistical methods was carried out by using air pollution data and meteorological data obtained at the Osaka Pollution Monitoring Station in 1972. Plots of oxidant concentrations and correlation coefficients against time revealed that oxidants concentration showed a 24-hour cycle, which made possible prediction a few hours in advance. The data showed that oxidants concentration was high at low wind velocity and high temperature on sunny days. The concentration was particularly high when the temperature was over 35 deg. Equations for the prediction of oxidants concentration 3 hours in advance were derived.

56276 **APTIC NO. 73605**

Leblans, W. N. and P. J. Rijkoort

THE SIGNIFICANCE OF THE VARIABILITY OF THE WIND DIRECTION FOR THE ASSESSMENT OF THE DISPERSION OF POLLUTANT FOLLOWING ACCIDENTAL DISCHARGE. *(De betekenis van de veranderlijkheid van de windrichting voor schattingen van de ligging van het besmette gebied na ongevallen met schadelijke stoffen). Text in Dutch. Koninklijk Nederlands Meteorologisch Instituut, De Bilt (The Netherlands), Rept. 74-12, 17p., 1974. 4 refs.*

The dispersion of noxious gases after an accidental discharge, as may occur during leakage, fires, explosions, and traffic accidents is determined by the nature and the duration of the accident and the specific meteorologicall circumstances. The contaminated area is determined in particular by the wind direction, the variability of this parameter, and the wind speed at the time of the accidental discharge. In cases of such accidents, it is essential to first determine a sector outside of which the atmosphere will not be contaminated at a high probability, usually 60% or 90-95% for residential areas. The probability of the absence of contamination is determined on the basis of wind direction and direction variability data. Then the progression of the contamination in time is investigated. The wind direction and the persistence of the wind direction are influenced by such factors as the presence of obstacles such as buildings and trees, height difference between the site of the discharge and of the rest of the terrain, temperature difference between the gas being released and the air, and by the miscibility of the gas with air. Heavy gases, such as chlorine, spread out horizontally above the ground before being entrained by the air masse

56277 **APTIC NO. 73580**

Lee, Yean

NUMERICAL MODELS FOR PRECIPITATION SCAVENGING. *Michigan Univ., Ann Arbor, Dept. of Atmospheric and Oceanic Science, Atomic Energy Commission Contract AT(11-1)-1407, Rept. C00-1407-52, 068670-2-S, 99p., April 1974. 71 refs.*

Two numerical models for precipitation scavenging are presented. The first is designed for precipitation scavenging in stratiform clouds and incorporates heuristic approximations of diffusive attachment, impact collection and accretion along with considerations of particle and cloud droplet size spectra. The model predicts the following: no single attachment rate constant or removal rate constant can adequately express the removal by rain of airborne contaminants; the contaminant concentration in the cloud air decreases exponentially with time when the processes of diffusive attachment and rainfall removal are considered; and the fraction of the air concentration of the contaminant that is attached to the cloud droplets is affected by processes of particle attachment and rainfall removal. The second model addresses the problem of air cleansing by a convective rain- generating system, with raindrop growth and motion in spatial contaminant concentration gradients being of major concern. A bell-shaped updraft profile is assumed, and the following conclusions are formed: the coalescence growth process is most rapid in the upward passage of droplets through the cloud rather than the downward passage; high concentrations of contaminant tend to be associated with the larger drops formed near the core and lower concentrations tend to be found in the smaller drops removed from the core; and these associations produce a positive correlation between rainfall rate and contaminant concentration. Sub-cloud evaporation, on the other hand, tends to produce a negative correlation between these two parameters because it affects the small drops much more strongly than the larger ones. (Author abstract modified)

56278 **APTIC NO. 80847**

Lyons, Walter A., Cecil S. Keen, and Richard A. Northouse

ERTS-1 SATELLITE OBSERVATIONS OF MESOSCALE AIR POLLUTION DISPERSION AROUND THE GREAT LAKES. *Preprint, American Meteorological Society, Boston, Mass., and World Meteorological Organization, Geneva (Switzerland), p. 273-280, 1974. 13 refs. (Presented at the Atmospheric Diffusion and Air Pollution Symposium, Santa Barbara, Calif., Sept. 9-13, 1974.)*

Highlights are given of air pollution data obtained by the Earth Resources Technology Satellite (ERTS-1). Individual plumes appear in photographs and can be studied either visually or by computer analysis. Recirculation of urban pollution following a nocturnal inversion near the Great Lakes is described. As the lake breeze front pushed onshore, the polluted air was forced up and over it and out over the lake, where the front of smoke was visible. Data from ERTS helped to explain an instance of interregional pollution transport affecting areas of Wisconsin. The ERTS-1 provided a graphic illustration of the extent to which entire air masses may become polluted during a late season heat wave associated with stagnant anticyclonic conditions over the eastern U. S. in early September 1973. The ERTS-1 has already proved valuable in air quality studies because of its extremely high resolution and multispectral characteristics. Data processing techniques are being developed to obtain quantitative estimates of pollutants from these data.

56279 **APTIC NO. 73607**

Marchant, J. W.

EFFECT OF FALLOUT OF WINDBORNE ZINC, LEAD, COPPER AND CADMIUM FROM A FUMING KILN ON SOIL GEOCHEMICAL PROSPECTING AT BERG AUKAS, SOUTH WEST AFRICA. *J. Geochem. Explor., vol. 3:191-198, 1974. 6 refs.*

The vertical and lateral extent of soil contamination resulting from the deposition of zinc, lead, copper, and cadmium dusts generated by a mining and fuming kiln operation was studied along three 4000-meter long radial traverse lines beginning just outside the area of slag dumping adjacent the kiln. Surface Pb values ranged from 36 ppm at 4000 m from the site to 770 ppm adjacent to the site, and zinc levels ranged from 123 ppm (4000 m distance) to 3225 ppm (on-site). Copper and Cd levels were insignificant. Zinc and Pb contamination did not penetrate to soil depth of 10 cm at any sampling location; depths of 30 cm were likewise contamination-free. (Author abstract modified)

56280 **APTIC NO. 73291**

Matsuda, Hiroyuki and Tsutae Nagayama

DETERMINATION OF DUST DEPOSITION CHARACTERISTICS ACCORDING TO ITS EMISSION SOURCE BY USING FLUORESCENT PARTICLE TRACER METHOD. *(Keiko ryushi toresa-ho ni yoru koka baijin haishutsugen senbetsuho). Text in Japanese. Denryoku chuo Kenkyusho Gijutsu Dai-ichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 73103:1-23, Aug. 1974. 2 refs.*

Coarse fluorescent particles, possessing the same rates of precipitation as stack dust, were injected into the stack of a thermal power plant. Fluorescent particles were emitted into the atmosphere, and their precipitation and diffusion behavior was monitored as an approximation of the precipitation and diffusion behavior of stack dust from that source. Fluorescent particle tracers were collected in distilled water in a simple dust jar, together with stack dust, filtered, dried, and exposed to ultraviolet radiation for determination of particle size and number. Sutton s equation (where rate of precipitation is taken into consideration) was used to calculate diffusion behavior and thus to determine the amount of dust deposition. Inclusion of various wind velocities in future calculations is desirable, although calculated and experimental results agreed well. Highest concentrations of dust deposition occurred within a radius of 0.1 km from the emission source, and dust particle sizes here were below 200 microns.

56281 **APTIC NO. 73187**

Matsumoto, T., H. Hayashi, S. Tazuya, S. Moori, Y. Nakamura, S. Ishikawa, T. Hatafuji, Y. Tootomi, and Y. Soga

HIGH OXIDANT CONCENTRATION IN NIIHAMA CITY, EHIME, JAPAN. *(Ehime- ken Niihama-shi ni okeru konodo okishidanto). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):561, Nov. 1974. 1 ref. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 410.)*

In Niihama city with littoral industrial area, facing Seto inland sea on the north side and surrounded by the Shikoku range on the south side, photochemical smog warning was issued twice in 1972 and 24 times (mostly in June and July) in 1973. The relationship between high oxidant concentration and meteorological conditions was analyzed. On high oxidant concentration days, the weather was mostly sunny or partially cloudy (80%), cloud cover was less, insolation was generally higher, and minimum temperature was also higher. The wind velocity was 1.1-1.4 m/sec and the sea breeze (northerly wind) was developed. The pressure pattern showed migratory high pressure over Honshu island or the southeast sea (70%). The atmospheric stability indicated that the presence of a surface inversion layer in the morning was one of the contributing factors for high oxidant concentration. The primary pollutant showed typical photochemical smog pattern (concentration peaks of nitric oxide, nitrogen dioxide, and oxidant) in 1/3 of the cases. The NO and NO2 concentrations were 0.8-1.5 pphm, while total hydrocarbon calculated as propane was 0.9-1.2 ppm.

56282 **APTIC NO. 80888**

Molenkamp, Charles R.

A ONE-DIMENSIONAL MODEL OF PRECIPITATION SCAVENGING. *Preprint, American Meteorological Society, Boston, Mass., 5p., 1974. 3 refs. (Presented at the American Meteorological Society Conference on Cloud Physics, Tucson, Ariz., Oct. 21-24, 1974.)*

NTIS: UCRL-75603

A numerical model of the development of a convective cloud is described which incorporates a representation of the scavenging of small particles. Efficient scavenging of small particles does not occur unless they are initially near or below the cloud base, and are active condensation nuclei. But when these conditions are met, precipitation scavenging of toxic materials produces deposition amounts comparable to the amount of toxic material in a vertical column of the undisturbed environment in the vicinity of the convective cloud. (Author abstract modified)

56283 **APTIC NO. 73195**

Murata, M., H. Tamura, and M. Kimoto

STUDIES ON THE PREDICTION OF OX CONCENTRATION (I). *(Okishidanto nodo no yosoku ni kansuru kenkyu (Dai-1-ho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):580, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 429.)*

A model for predicting maximum oxidant concentration based on pollutant concentrations in the morning and meteorological conditions was developed. The characteristic values were classified into four groups according to factor load, which were pollutant (nitrogen oxides, total hydrocarbons, dust); meteorological condition I (weather, cloud amount, humidity); meteorological condition II (ground temperature, temperature difference, maximum temperature); and meteorological condition III (wind velocity, wind direction). Visibility and insolation intensity were independent variables. The oxidant concentration distribution on 15 coordinates in 15 dimensional space was projected on the Z1 and Z2 planes, which were classified into three groups. Selecting five variables, NOx, maximum humidity (Hmax), maximum temperature (Tmax), visibility (V), and insolation intensity (SR), a multiple regression equation was obtained: Oxmax equals 1.54 NOx + 3.40 SR - 0.16 Tmax 0.63 Hmax 2.86 V + 48.8. The predicted values and measured values on high oxidant concentration days in 1974 were in good agreement.

56284 **APTIC NO. 73643**

Nappo, Carmen J., Jr.

PARAMETERIZATION OF SURFACE MOISTURE AND EVAPORATION RATE IN A PLANETARY BOUNDARY LAYER MODEL. *In: Environmental Research Laboratories 1973 Annual Report. National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. ATDL-106, p. 149-170, Dec. 1974. 20 refs.*

Two methods of parameterizing expression for ground surface evaporation rate that are used in planetary boundary layer models are compared. The first method specifies that the surface evaporation rate is proportional to the moisture availability parameter times the difference between the surface saturation mixing ratio and the mixing ratio at the lowest level of the atmospheric model. The second method states that the surface evaporation rate is proportional to the product of relative humidity immediately above the ground and the surface saturation mixing ratio minus the mixing ratio at the lowest level of the atmospheric model. An analysis of each method with different specifications for the moisture availability parameter and the relative humidity immediately above the ground via the running of a planetary boundary layer numerical model several times yields the following conclusions: for equal moisture availability parameters and relative humidities the second method results in higher surface temperatures than the first; the surface evaporation rate calculated by the first method is less sensitive to changes in the moisture availability parameter than the surface evaporation rate calculated with the second method is to changes in relative humidity; negative surface evaporation rates can occur much more easily using the second method than the first; and calculation of the relative humidity by calculating the flux of moisture below the ground surface does not improve the model used in the study. (Author abstract modified)

56285 **APTIC NO. 73190**

Ohira, S., T. Takahashi, M. Karasawa, E. Ebisawa, and K. Taguchi

ON THE PHOTOCHEMICAL SMOG OF IBARAKI. *(Ibaraki-ken ni okeru kokagaku sumoggu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):557, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 404.)*

The status of photochemical smog in Ibaraki Prefecture is reviewed. Numbers of afflicted persons registered were 728 in 1972 and 207 in 1973 showing a decreasing trend. Numbers of smog forecasting issued were 53 in 1972 and 107 in 1973, and warnings issued were 23 in 1972 and 46 in 1973, mostly during July and August. Oxidant concentration above 0.1 ppm occurred at 11:00 am - 6:00 pm, mostly at 2:00-3:00 pm. On high oxidant concentration days, the meteorological characteristics were high temperature, high insolation, and S-SW wind with velocity of 2-3 m/sec. In the case of NW-NE wind, high oxidant concentration occurrence was rare. The high oxidant concentration area was spread from the southern region to the northwestern region and even to rural areas away from traffic and industrial areas. These results indicated that the photochemical smog in Ibaraki is caused by pollutants transported by S-SW wind from neighboring prefectures.

56286 **APTIC NO. 73186**

Oya, F., S. Ochiai, Y. Kitazawa, T. Onoma, and Y. Harada

METEOROLOGICAL CONDITIONS ON HIGH LEVEL CONCENTRATION OF PHOTOCHEMICAL SMOG OXIDANT. *(Kokagaku sumoggu okishidanto ko-nodo no kisho joken). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):566, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 415.)*

Smog warnings were issued 30 times during the period of April to Sept. 1973 in Kanagawa Prefecture. The meteorological characteristics on these high oxidant concentration days were analyzed based on data compiled at the Yokohama Weather Station. The weather was sunny 65% of the time and partially cloudy the rest of the time. The maximum temperature was above 30 C 63% of the time, 25-30 C 30% of the time and below 25 C the rest of the time. The wind direction was mostly north or east at 9:00 am and south or southwest at 3:00 pm. The wind velocity was less than 3 m/sec 85% of the time at 9:00 am and 3-5 m/sec at 3:00 pm. The maximum mixed layer altitude was 700-1000 m 50% of the time and 1000-1600 m 40%. Three types of wind pattern were associated with two-thirds of the time of the high oxidant concentration incidences.

High oxidant concentration developed in the convergence area of sea and land breezes where the pressure gradient was small.

56287 **APTIC NO. 73632**

Penzhorn, R. -D., W. G. Filby, and H. Guesten

CALCULATION OF THE RATE OF PHOTOCHEMICAL DEGRADATION OF SULFUR DIOXIDE IN THE LOWER ATMOSPHERE OVER CENTRAL EUROPE. *(Berechnung der photochemischen Abbaurate des Schwefeldioxids in der unteren Atmosphaere Mitteleuropas). Text in German. In: Chemische Reaktionen atmosphaerischer Schadstoffe. Kernforschungszentrum Karlsruhe, Karlsruhe (West Germany), Institut fuer Radiochemie, p. 3-15, May 1974. 25 refs.*

The homogeneous degradation of sulfur dioxide in the lower atmosphere of Central Europe was calculated on the basis of the photophysical data of SO2 within its absorption bands (2900-4000 A) and the measured monochromatic actinic irradiance (solar quantum flux) in Central Europe. The maximum rate of the sunlight-induced photooxidation was 0.19-0.25%/hr in summer, and 0.012-0.016%/hr in winter, as a function of the sun s altitude. Small concentrations of nitric oxide and olefins, as well as heterogeneous catalytic reactions may increase the rate of degradation of SO2 by a factor of up to 10.

56288 **APTIC NO. 80790**

Rosenberg, N. W., R. E. Good, W. K. Vickery, and E. M. Dewan

EXPERIMENTAL INVESTIGATION OF SMALL SCALE TRANSPORT MECHANISMS IN THE STRATOSPHERE. *AIAA (Am. Inst. Aeron. Astronaut.) J., 12(8):1094-1099, Aug. 1974. 19 refs. (Presented at the AIAA/American Meteorological Society International Conference on the Environmental Impact of Aerospace Operators in the High Atmosphere, Denver, Colo., June 11-13, 1973, Paper 73-496.)*

NTIS, DDC: AD A000975

Transport properties in the stratosphere were measured in an experimental program in which smoke trails, deposited by rockets and aircraft, were recorded by time lapse photography. This allowed winds, wind shears, and the rate of dispersion of the smoke to be calculated. Tracer trails gave a value for turbulent diffusivity in the 20 km region of about 0.7 sq m/sec. The spatial turbulence structure was determined from measured wind shears. Average energy spectra was obtained for total vertical profiles and segmented profiles of horizontal winds. The energy spectrum dependence exponent was consistently close to -2.8. Twenty percent of the sample population in the case of segmented profile spectra showed n less than 2.2, indicating an inertial subrange. This is consistent with the presence of intermittent thin layers of efficient mixing in the 5 to 18 km range. Wind shear and amplitude both increased with altitude in this region. (Author abstract modified)

56289 **APTIC NO. 73245**

Saito, S. and H. Takeda

PREDICTION OF AIR POLLUTION CONCENTRATION USING MAIN COMPONENT OF CORRELATION COEFFICIENTS. *(Sokankansu no shuseibun o mochiita taiki osen nodo no yosoku). Text in Japanese. Preprint, Japan Society of Automatic Control, Kyoto, p. 431-432, 1974. (Presented at the Japan Society of Automatic Control, 17th Lecture Meeting, Kyoto, Japan, Nov. 21-23, 1974.)*

Predictions of sulfur dioxide concentration at Shiokama city and Taga city was carried out from May 1972 to March 1973 by using Farmer s major components of correlation coefficient. Measurement results were classified into 5 patterns and their correlation matrices were composed. The major components were then derived from the matrices. Results showed that the predicted values of SO2 concentration in Feb. 1973 in Shiokama city were in good agreement with the measurement values, which gave concentrations ranging from below 0.01 ppm to 0.06 ppm. The predicted values in Taga city were also in good agreement with the measurement values.

56290 **APTIC NO. 73205**

Shiozawa, Kiyoshige, Shinichi Okamoto, and Atsushi Otaki

FORECASTING SYSTEM FOR AIR POLLUTION. *(Taiki osen no yosoku shisutemu ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(12):2371-2386, Dec. 1974. 27 refs.*

Atmospheric pollution forecasting systems are discussed. Statistical and diffusion models for use in pollution prediction are analyzed, and their virtues and shortcomings are listed. Computer simulations can provide workable data, but costs of calculation can escalate as a geometric progression, with increase in accuracy.

56291 **APTIC NO. 73227**

Shiwaku, Yasumasa, Yoshiyuki Shinke, and Ryota Ebata

THE TECHNIQUE OF FORECASTING PHOTOCHEMICAL SMOG. *(Okishidanto konodo shutsugen jokyo to sono yosoku shuho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):579, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 428.)*

The status of high oxidant concentration days (above 0.1 ppm) in the Akaho area and its characteristics were studied. The data on number of high oxidant concentration days from April to October, number of days forecasting or warnings were issued, time of day when high oxidant concentration was measured, duration of high oxidant concentration, and time of day when the maximum oxidant concentration was observed were compiled and analyzed in reference to meteorological conditions such as wind velocity, wind direction, maximum temperature, inversion layer altitude, and inversion intensity. The average correlation coefficients calculated were -0.679 for minimum temperature and diurnal temperature range, 0.554 for diurnal temperature range and oxidant concentration, and -0.366 for minimum temperature and oxidant concentration. Based on meteorological conditions, pressure pattern, maximum temperature, diurnal temperature range, minimum temperature in early morning, wind velocity, and wind direction fairly accurate forecasting of high oxidant concentration was made from April to Aug. 1974.

56292 **APTIC NO. 73645**

Start, G. E. and L. L. Wendell

REGIONAL EFFLUENT DISPERSION CALCULATIONS CONSIDERING SPATIAL AND TEMPORAL METEOROLOGICAL VARIATIONS. *National Oceanic and Atmospheric Administration, Idaho Falls, Idaho, Air Resources Labs., Rept. ERL ARL-44, 68p., May 1974. 10 refs.*

An objective regional trajectory analysis scheme which is combined with a Gaussian diffusion model to yield a technique called MESODIF (mesoscale diffusion) is described and compared with calculations based on conventional wind rose joint frequency statistics (single wind station). The trajectory analysis scheme utilizes wind data from a network of tower-mounted wind sensors to consider the effects of spatial variabilities of horizontal wind flow near the surface. The trajectory scheme also incorporates time changes in the diffusion rates of an effluent and uses an upper level lid to vertical mixing. Diagnostic comparisons of regional dispersion effects from each technique for a region about 100 by 130 km and for time spans ranging from 6 hr to 1 yr show significant differences over the range of scales considered. Effluent recirculations and stagnations that are related to local wind variabilities about terrain features appear to produce localized zones of enhanced exposure to airborne effluents. These zones are not resolved by the conventional wind rose model. The greatest shortcoming of the single wind station dispersion model for short or accidental type of emissions is its failure to identify the subregion affected within a region of spatially variable winds. The wind-rose model calculations are significantly biased to overestimation of annual total integrated concentrations by about an order of magnitude at distances beyond about 25-50 km. The inability of the wind rose model to accommodate time changes in stability category during effluent transport to more distant receptors is the single most influential factor of this bias. (Author abstract modified)

56293 **APTIC NO. 73210**

Sumida, Tomoo and Shigeru Nakaya

VARIATION IN PARTICLE SIZE DISTRIBUTION OF AEROSOL. *(Earozoru no ryukei bunpu no hendo ni tsuite). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 12:86-89, 1974.*

The diurnal variation in particle size distribution of aerosol in the atmosphere was measured simultaneoulsy with average particle size, particle number concentration, electrical conductivity, radon concentration, temperature, and humidity. A description of the measurement method and instruments used are given. The average particle size with a peak at 3:00-5:00 am showed an inverse correlation to the particle number concentration. The electrical conductivity was found to be greatly influenced by the average life of small ions and not by the variation in Rn concentration. The relationship between electrical conductivity and the average life of small ions was proportional, while no certain correlation was found between electrical conductivity and particle number concentration.

56294 **APTIC NO. 80653**

Trout, Dennis A. and H. A. Panofsky

MESOSCALE DISPERSION FROM A LARGE CITY. *Advan. Geophys., vol. 18 B:151-157, 1974. 7 refs.*

The air pollution effect of cities and other industrial complexes can be felt outside of the cities. Considerable concentrations up to distances of 200 km have frequently been measured. Measurements of meteorological variables and contaminants in the neighborhood of St. Louis, Missouri, a large, isolated city, without complex terrain, are described, and compared with a simple model. An equation gives the concentration of the contaminant in terms of the source strength, the inversion height, and the mean wind between the surface and the inversion height. The mean wind and the inversion height are determined from radiosonde ascents. The dispersion is modelled by an effective point source upwind of the center of the city. A field study to test the equation in the environment of St. Louis was carried out. A field study to test the equation in the environment of St. Louis was carried out. The chosen contaminant was sulfur dioxide, and its decay products. Concentrations were measured with an analyzer which relies on changes of conductivity in water due to the presence of sulfur dioxide and other contaminants. Apparently there is no systematic vertical variation in SO2 concentration below the inversion height. Considering the many restrictive assumptions in the model, the agreement between measured and computed concentrations is remarkably good. More than 90% of the computed concentrations were within a factor of two of the observed concentrations, and the correlation coefficient between observed and computed concentrations exceeded 0.8.

56295 **APTIC NO. 73194**

Ueda, J., M. Takahashi, C. Nakajima, and H. Tagawa

ON THE PREDICTION OF AIR POLLUTION BY PHOTOCHEMICAL REACTION IN KYOTO CITY. *(Kyoto-shi ni okeru kokagaku hanno ni yoru taiki osen no yoho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):578, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 427.)*

Based on analysis results of data compiled during 1973 in Kyoto, a forecasting method for oxidant concentration by flow chart was developed. Data were obtained during the period from July to Oct. 1973. The oxidant concentration was low on rainy days except for the case of thunder showers. Positive correlation (+0.691) was found between maximum oxidant concentration and nitrogen dioxide concentration at 9:00 am. Negative correlation (-0.568) was found between the temperature difference at the top of Mt. Hiei (832 m) and ground level (70 m) and oxidant concentration. Oxidant concentration was low in the case of wind velocity above 3.5 m/sec at 9:00 am. Oxidant concentration was generally low in the day with maximum temperature below 32 C. Oxidant concentration was high in the day with diurnal temperature range above seven C. Oxidant concentration was high on days of summer-type pressure patterns with high pressure over Kyoto. The forecasting flow chart for high oxidant concentration developed includes such items as rainfall, NO2 concentration, wind velocity, temperature difference with altitude, maximum temperature forecasted, wind direction, diurnal temperature range, maximum temperature deviation from average maximum temperature and wind direction at 9:00 am.

56296 **APTIC NO. 73328**

Ueda, J., K. Okazaki, Y. Nakamura, H. Nakajima, and M. Takahashi

SOME FEATURES OF AIR POLLUTION BY PHOTOCHEMICAL REACTION IN THE KYOTO BASIN. *(Kyoto bonchi ni okeru kokagaku hanno ni yoru taiki osen no tokucho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):560, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 407.)*

The relationships of oxidant concentration to meteorological conditions and other pollutant concentrations were analyzed. The diurnal variation in oxidant on high concentration days showed three patterns: oxidant concentration with peaks in the morning and decreased in the afternoon, low concentration in the morning which increased in the afternoon with peak at 2:00-3:00 pm, and superimposition of the first two patterns with high concentration from noon to 5:00-6:00 pm. The oxidant concentration was less than 0.2 ppm in the first pattern, while it often exceeded 0.2 ppm in cases of the latter two patterns. A significant correlation was found between oxidant concentration and atmospheric stability, and the correlation coefficient between oxidant concentration and temperature difference was -0.58. The correlations with maximum temperature, diurnal range, duration of sunshine, wind velocity, and wind direction were similar to known cases. In the Kyoto basin, however, southwest wind during the daytime was a necessary condition for high oxidant concentration. The correlation between oxidant and nitrogen dioxide was significant; high morning oxidant concentration was accompanied by high nitrogen dioxide concentration in early morning.

56297 **APTIC NO. 80818**

Williams, Allen L.

AN ANALYSIS OF IN-CLOUD SCAVENGING EFFICIENCIES. *Preprint, California Univ., Livermore, Calif., Lawrence Livermore Lab., 24p., Oct. 1974. 17 refs. (Presented at the Illinois State Water Survey. Precipitation Scavenging Symposium, Champaign, Ill., Oct. 14-18, 1974.)*

NTIS: UCRL-75897

A mathematical analysis of in-cloud scavenging mechanisms and their efficiencies is presented. Differences in attachment rates when both convection and diffusion were considered, as opposed to diffusion alone, were evident even for particles with a radius of 0.005 micron. The effect of including turbulent diffusion in addition to Brownian diffusion in convective diffusion equations was important for particle radii greater than about 0.05 micron. Thermophoresis and diffusiophoresis appeared as corrections to the convection turbulent diffusion attachment rate. The phoretic effects for condensing droplets were exaggerated since the calculation was for 0.5% supersaturation which is not maintained above the activation zone in cumulus clouds. The supersaturation ratio minus 1 quantity appeared as a linear factor in the phoretic attachment rates. Electrical effects appeared to be potentially very important, perhaps dominating in cloud removal processes. Once particles were activated, they demonstrated quick growth up to several microns in radius due to water vapor diffusion; they also experienced a high inertial capture removal rate.

56298 **APTIC NO. 73373**

Yokohama Municipal Office (Japan)

OUTBREAKING CONDITIONS OF PHOTOCHEMICAL SMOG. *(Kokagaku sumogu hassei jokyo). Text in Japanese. Kokagaku Sumogu Chosa Hokokusho (Rep. Photochem. Smog Invest.), vol. 2:1-70, March 1974.*

The atmospheric pollution monitoring system, particularly the oxidant concentration monitoring system in Yokohama city, emergency procedures for issuing warnings, alerts, and emergency alerts, and the forecasting system for photochemical smog formation are described with maps and flow sheets. The data on the frequency of photochemical smog warning issued in Yokohama and other surrounding cities during 1973 and oxidant concentration, diurnal variation in oxidant concentration, and oxidant concentration distribution and the weather map on days when photochemical smog warning was issued are compiled. The characteristics of photochemical smog formation and oxidant concentration and meteorological conditions on typical smog formation days are discussed. The data on photochemical smog affliction, 28 cases and 1545 people afflicted are analyzed in relation to the data on smog formation, oxidant concentration and meteorological conditions. A review of the formation mechanism of photochemical smog and its control measures are also included.

56299 **APTIC NO. 73394**

Osaka Environmental Pollution Monitoring Center (Japan)

ANALYSIS ON THE WEATHER CONDITIONS AND OXIDANT CONCENTRATION IN OSAKA. *(Osaka no kisho joken to okishidanto nodo no kaiseki). Text in Japanese. Kokagaku Sumogu ni Kansuru Chosakenkyu (Res. Rep. Photochem. Smog), vol. 1:246-263, 1974.*

Investigations on oxidant concentrations and meteorological conditions in Osaka Prefecture were carried out from June to October in 1971 and 1972. In 1971, 13 forecasts and 4 warnings on photochemical smog were issued while the numbers increased to 27 and 17, respectively, in 1972. The oxidants concentrations from 11:00 am to 4:00 pm during smog forecast and warning were generally higher than 0.1 ppm and the insolation was about 270 yl/5hr from 10:00 am to 2:00 pm. Wind velocity was generally below 3 m/s and the sky was clear when oxidants concentration was over 0.1 ppm. More than 90% of high oxidant concentration occurred at high temperature betwen 24 and 31 deg and at 45-65% humidity. The high oxidants concentration was also controlled by the movements of high and low pressures, particularly high pressure from south and north.

56300 **APTIC NO. 73449**

Himeji Municipal Office (Japan), Bureau of Health and Environment

SURVEY REPORT ON EFFECTS OF AIR POLLUTION ON HEALTH IN HIMEJI CITY 1973. *(Himeji-shi ni okeru taiki osen no kenko ni oyobosu eikyo chosa hokokusho). Text in Japanese. 30p., March 1974.*

Atmospheric pollution data from April 1973-March 1974 in Himeji City, Japan and its environs are listed. Pollutants (sulfur dioxide; precipitated dust; airborne dust; nitrogen oxides; and photochemical oxidants) were measured at 36 monitoring stations, some operated by the city, and others by various industries. Pollutant levels have decreased since 1969, but seem to have leveled off in improvement for 1972-1973. In 1973 there were 23 photochemical smog warnings (20 in July and August) and 4 alerts (2 each in July and August). Meteorological conditions which accompany photochemical smog formation were analyzed into three components: high atmospheric pressure; land breezes and sea breezes; and distribution of photochemical smog concentrations. Ground level high pressure and high altitude high pressure both contribute individually to photochemical smog formation. In the presence of ground level high pressure there are representative patterns of oxidant distribution for different ranges of concentrations (high, greater than 0.15 ppm/hr; medium, greater than 0.10 ppm/hr; and low, less than 0.10 ppm/h). Wind patterns similarly forecast the degree of photochemical smog formation. Three patterns of smog concentration distribution were found: A-type, stationary (weak wind of less than 10 m/s from ground level to altitude of 12 km); B-type, moving northward (occurs in general with weak, inclined winds at lower layers of atmosphere); and C-type, moving southward (ground level high pressure covers a wide region).

1973

56301 **APTIC NO. 80595**

Bortoli, M. de and P. Gaglione

VARIABILITY OF WASHOUT RATIO FOR SOME FALLOUT RADIONUCLIDES. *International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 167-180. 18 refs. (Nov. 12-16.)*

The air concentration fo some fallout radionuclides and their activity following deposition on the ground were measured on a monthly basis. Individual washout ratio values were scattered over a wide range, with maximum values being as much as 60 times more than minimum values. Radionuclide differences did not contribute significantly to the observed variation in washout values. Monthly effects, however, were significant. No correlation was apparent between the washout ratio and meteorological parameters such as rain and humidity. (Author abstract modified)

56302 **APTIC NO. 73567**

Cagnetti, P.

EVALUATION OF THE VERTICAL DISPERSION OF SHORT-TERM GASEOUS EMISSIONS AT BRASIMONE. *(Valutazione della dispersione verticale di rilasci gassosi di breve durata sul sito del Brasimone). Text in Italian. Comitato Nazionale Energia Nucleare, Rome (Italy), RT/PROT-(73)19, 30p., 1973.*

Three experiments which evaluate the vertical dispersion of short gaseous emissions on the order of 15 min, using photographic exposure smoke are discussed. Plume behavior is analyzed.

56303 **APTIC NO. 80591**

Doury, A.

PRINCIPLES FOR FULL NUMERICAL TREATMENT OF PHYSICAL TRANSFERS IN THE ATMOSPHERE AND HYDROSPHERE. *(Principles de traitement numerique complet des transferts physiques dans l atmosphere et dans l hydrosphere). Text in French. International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 443-456. 5 refs. (Nov. 12-16.)*

The numerical treatment of the physical transfer of contaminants in the atmosphere and the hydrosphere is discussed. Advection, diffusion, sources, and sinks are distinguished; and a diffusion equation is solved by a Gaussian technique for which the coefficients are drawn from experimental results. An elementary formulation which corresponds to a case of instantaneous point emissions is adopted, making possible the resolution of physical transfer processes on both local and regional scales with a minimum of calculation. The method can be continually upgraded since the numerical values of the parameters used can be modified on the basis of experience. These numerical values are already sufficiently accurate for cases involving the atmosphere but are inadequate for transfer processes over the oceans.

56304 **APTIC NO. 73272**

Ebisawa, Eiji

WEATHER CONDITION IN KASHIMA AREA. *(Kashima chiku no kisho). Text in Japanese. Annu. Rept. Environ. Pollut. Res. Cent. Ibaragi Ken, no. 6:70-76, 1973.*

Meteorological data including temperature, humidity, rain, and wind velocity were obtained from April 1972 to March 1974 for an air pollution study. A pyrheliometer was equipped for a photochemical smog study. The NE wind which is believed to be responsible for the air pollution in the area contributed 11% in the spring, 16% in the summer, and 10% in the winter. The average wind velocity was in the range of 2-4 m/sec with strong NE wind in the spring. The average temperature in summer was 26-28 deg, and the average humidity from July to September was between 75-85%. High rainfalls were recorded in March, April, and October. Wind velocity and wind direction varied frequently at an altitude of 400 m.

56305 **APTIC NO. 80795**

Eschelbach, Guenter

NUMERICAL CALCULATIONS CONCERNING THE BRIGHTNESS, THE RATE OF POLARISATION AND THE RADIATIVE DIVERGENCIES OF THE ENERGY FLOW IN THE VISIBLE RANGE OF THE SOLAR SPECTRUM IN TURBID ATMOSPHERE WITH CONSIDERATION OF MULTIPLE DIFFUSION. *(Calculs numeriques concernant la luminance, le taux de polarisation et les divergences du flux energetique de la region visible du spectre solaire dans l atmosphere trouble tenant compte de la diffusion multiple). Text in French. Ann. Geophys., 29(2):329-339, April-June 1973. 13 refs.*

The method chosen to solve the equation of radiative transfer for the four Stokes parameters gives not only the radiation emerging at the boundaries, but also the internal field of the atmosphere and takes into account a variable vertical distribution of turbidity. The influence of the grey absorption of aerosol particles on the radiance and the polarization is shown. The dependence of the atmospheric radiation balance from the turbidity is investigated by presenting some results of the reflectivity of the planet earth and of the radiative divergence and its heating rates. All results prove that the influence of the particle absorption and of the ground albedo is very important. (Author abstract)

56306 **APTIC NO. 80683**

Forbes, Richard E.

THE GEOMETRY AND PHYSICAL PROPERTIES OF EXHAUST CLOUDS GENERATED DURING THE STATIC FIRING OF LARGE ROCKET ENGINES. *American Society of Mechanical Engineers, New York, Fluids Engineering Div., Am. Soc. Mech. Engrs. Joint Meet. Fluids Eng. Div. Appl. Mech. Div., Atlanta, Ga., 1973, p. 193-201. (June 20-22.)*

The geometry and physical properties of exhaust clouds generated during the static firing of large rocket engines were investigated. At lower altitudes the rocket exhaust cloud or plume closely resembled a free-jet type of flow; wheres at upper altitudes where the cloud was approaching an equilibrium condition, the structure was very similar to a natural cumulus cloud. Condensation was first observed at an altitude of approximately 1680 meters. Although the maximum aircraft penetration altitude in the clouds was approximately 4200 m, the maximum cloud tops were estimated to reach 7500 m.

56307 **APTIC NO. 80590**

Helm, W. R. and B. C. Winkler

CLASSIFICATION OF WEATHER ACCORDING TO LAPSE RATE. *International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 487-494. 5 refs. (Nov. 12-16.)*

An attempt to represent experimental diffusion data by the use of a dispersion formula in which the diffusion parameters are correlated with the vertical temperature gradient is presented in connection with the quantification of the dispersion of gaseous and radioactive effluents generated by nuclear installations. The following weather classifications are used to relate four weather categories to the observed temperature gradient: unstable, neutral, moderately stable, very stable, strong lapse, weak lapse, weak inversion, and strong inversion. The advantage of the approach is that the weather can be classified according to parameters which can be obtained by physical measurement. The method shows relatively good agreement with data from dispersion experiments and appears useful for the rapid prediction of the consequences of accidental releases of radioactivity.

56308 **APTIC NO. 73629**

Karol, I. L.

PLANETARY DISTRIBUTION OF LEAD-210 AND POLONIUM-210 IN THE LOWER STRATOSPHERE AND THEIR USE FOR EVALUATING TRANSFER PARAMETERS. *(Planetarnye raspredeleniya soderzhaniya svintsa-210 i poloniya- 210 v nizhney stratosfere i ikh ispol zovanie dlya otsenki parametrov perenosa). Text in Russian. Tr. Gl. Geofiz. Observ. (Leningrad), no. 315:46-60, 1973. 12 refs.*

The lead-210 and polonium-210 concentration measurements conducted during the 1967-1970 period are evaluated with respect to the evaluation of the horizontal and vertical transfer processes in the troposphere and the lower stratosphere over various zones of the northern and southern hemispheres. The concentrations measured below the tropopause at moderate and high latitudes has a fall maximum and a winter-spring minimum. Seasonal variations were found in the 18-20 km layer and in the tropics. The penetration of air masses with high lead and polonium concentrations from the troposphere into the stratosphere was most intense in summer between 30 deg S and 70 deg N. The global horizontal transfer was just as intense as the vertical one.

56309 **APTIC NO. 80589**

Koenig, L. A., K. Nester, H. Schuettelkopf, and M. Winter

EXPERIMENTS CONDUCTED AT KARLSRUHE NUCLEAR RESEARCH CENTRE TO DETERMINE DIFFUSION IN THE ATMOSPHERE BY MEANS OF VARIOUS TRACERS. *International Atomic Energy Agency, Vienna (Austria) and World Meteorologic Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 67-90. 11 refs. (Nov. 12-16.)*

Experiments designed to experimentally verify diffusion calculations required for safety considerations involved in the operation of nuclear facilities were performed. Tritiated water vapor and carbon tetrachloride were used as tracers and were simultaneously mixed with the exhaust air from a reactor stack 100 m high. A comparison of the experimentally determined parameters with the respective Pasquill-Gifford parameters revealed that the position of the maximum ground level concentration is clearly shifted towards the source contrary to the expected position based on the diagnosed category and that the measured maximum ground level concentration is higher than expected from the diagnosed diffusion category. (Author abstract modified)

56310 **APTIC NO. 80666**

Lyons, Walter A. and Richard A. Northouse

THE USE OF ERTS-1 IMAGERY IN AIR POLLUTION AND MESOMETEOROLOGICAL STUDIES AROUND THE GREAT LAKES. *Preprint, Goddard Space Flight Center, Washington, D. C., p. 1491-15C1, 1973. 5 refs. (Presented at the Earth Resources Technology Satellite-1 Symposium, 3rd, Washington, D. C., Dec. 10-14, 1973, Paper E 1.)*

Mesoscale pollution transport phenomena along the western shore of Lake Michigan was studied using aircraft, pilot balloon and tetroon wind measurements, a nine station air quality monitoring network, and the Earth Resources Technology Satellite (ERTS-1). An ERTS-1 image revealed smoke plumes from industrial clusters at Lake Michigan s southern end streaming more than 60 m northeastwards. As these plumes moved overland, they almost certainly underwent continuous fumigation to the surface about 5 to 10 km inland, undoubtedly causing high levels of pollution at the surface. Morning rush hour automotive exhausts from Chicago probably become trapped within the lake breeze cell, and travel in a long helical trajectory northwards to Milwaukee. The ERTS imagery incontrovertibly shows that major plumes can modify and induce convective cloud development both during the winter and summer months. Intersecting wave patterns are visible in an ERTS photograph of a fog due to an inversion over Lake Michigan. Intense internal gravity waves are being generated near the top of the surface based inversion. They propagate, and those striking the shoreline bluffs are reflected.

56311 **APTIC NO. 80695**

Miller, C. W. and T. W. Cadman

ANALOG SIMULATION OF THE DISPERSION OF ATMOSPHERIC POLLUTANTS. *Chem. Eng. Educ., 7(1):33-35, Winter 1973.*

The analog simulation of the dispersion of atmospheric pollutants is discussed. Beginning with a commonly accepted dispersion model, the steps involved in the analog simulation of the vertical concentration profile downwind of a line source are outlined. Simulations are run both for the vertical concentration profile at a fixed distance downwind and for the vertical concentration profile as the distance downwind increases linearly. The model assumes complete reflection of the pollutant at the ground. Example profiles of dispersion are illustrated for downwind distances of 200, 300, and 400 m.

56312 **APTIC NO. 80685**

Morr, G. F. and S. L. Soo

FLOW OF A DUST SUSPENSION OVER AN ELLIPSOID OF REVOLUTION. *American Society of Mechanical Engineers, New York, Fluids Engineering Div., Am. Soc. Mech. Engrs. Joint Meet. Fluids Eng. Div. Appl. Mech. Div., Atlanta, Ga., 1973, p. 151-160. 10 refs. (June 20-22.)*

Wind tunnel experiments investigating the boundary layer motion and deposition of a turbulent suspension of magnesia dust in air flowing over an ellipsoid of revolution were performed to determine the interaction of flow and deposition in the regions of flow stagnation, limit line of particle impact, limit line of flow separation, and wake region. A correlation based on a momentum integral method gave the relations between thicknesses of boundary layers. Diffusive deposition occurred in regions where the normal component of the particle cloud-mass mean motion was expected to be nearly parallel to the surface. In these regions the deposits were slightly cohesive and adhered loosely to the surface. The net deposition in the diffusive band was nearly linearly dependent on sampling time.

56313 **APTIC NO. 80694**

Rao, A. M. and J. K. Patnaik

INFLUENCE OF AIR POLLUTANTS ON POINT DISCHARGE CURRENTS IN THE ATMOSPHERE. *Curr. Sci., 42(14):504-506, July 20, 1973. 8 refs.*

The influence of air pollution on the point discharge currents in the atmosphere was investigated. Point discharge current measurements were made in a polluted area and a relatively unpolluted area using a bipolar logarithmic amplifier with a reversely biased double diode. Aerosol collectors were positioned about 4 m above the ground to measure the degree of pollution. Point discharge currents were higher in the polluted area, ranging from about twice to over 10 times the values of electrical discharge current recorded in the relatively unpolluted area.

56314 **APTIC NO. 80598**

Reimer, A., J. K. Reichert, and A. G. Scott

EFFECT OF METEOROLOGICAL VARIABLES ON ATMOSPHERIC SUSPENDED PARTICULATES AND ASSOCIATED NATURAL RADON AND THORON DAUGHTERS. *International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 189-210. 19 refs. (Nov. 12-16.)*

The effects of meteorological variables on suspended particulates and natural radon and thoron daughters in the lower atmosphere over Manitoba, Canada were examined. Radon and thoron daughter concentrations depended mainly on temperature and wind during the summer; no clear-cut association was observed during the winter. Monthly mean particulate concentrations varied from about 25 micrograms/cu m during the summer to about 8 micrograms/cu m during the winter except during periods of soil erosion. A particulate concentration cycle with a duration of 3-4 days was observed which agreed closely with the atmospheric pressure periodicity (3.5-3.9 days) for this latitude, illustrating the physical dependence of pollution cycles on synoptic scale meteorological features. (Author abstract modified)

56315 **APTIC NO. 80596**

Rzekiecki, R.

USE OF TRACER METHOD FOR COMPARING THE GROUND-LEVEL DISTRIBUTION OF AEROSOLS AND GASES EMITTED FROM NUCLEAR FACILITIES. *(Comparaison par une methode de tracage de la distribution au sol des aerosols et des gaz dans le vent des installations polluantes). Text in French. International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 153-166. 9 refs. (Nov. 12-16.)*

Simultaneous releases of the gaseous tracer sulfur hexafluoride and the aerosol tracer uranine-S were made from various sites under various meteorological conditions to compare the diffusion behavior of an aerosol having a diameter of less than 10 micron with that of a gas. The diffusion coefficients were compared on the basis of the normalized concentrations measured under the same conditions at various distances from the release point. A difference in diffusion behavior was detectable only at wind speeds greater than 5 m/sec. Experimental graphs plotted for the uranine-S aerosol were applicable to the gaseous tracer within a factor of two.

56316 **APTIC NO. 80621**

Stephens, Edgar R.

PHOTOCHEMICAL FORMATION OF OXIDANTS. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 465-487. 10 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Most of the bad effects of smog are due to secondary pollutants. The photochemical reactions involving oxides of nitrogen and ozone are discussed. Nitric oxide conversion is the first stage. Since it depends on hydrocarbon oxidation, reduction in the amount or reactivity of the hydrocarbon prolongs the first stage and delays the onset of ozone, peroxyacyl nitrate (PAN), and aerosol formation. Reducing hydrocarbon permits higher NO2 accumulation but reducing NOx emissions makes ozone control more difficult. Sulfate and PAN are also considered. Oxidant concentration trends in California are discussed. Control of hydrocarbon is the best way to achieve ozone control. Control measures may be beneficial in some areas and detrimental in others. Since ozone appears to be the more serious hazard, it appears that hydrocarbon control should take precedence over NO control.

56317 **APTIC NO. 80592**

Van der Hoven, I., C. R. Dickson, G. E. Start, and L. L. Wendell

RECENT ANALYTICAL AND EXPERIMENTAL EFFORTS ON SINGLE-SOURCE EFFLUENT DISPERSION TO DISTANCES OF 100 KM. *International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 427-441. 4 refs. (Nov. 12-16.)*

Single source effluent dispersion to distances of 100 km was studied using objective mesoscale streamline and trajectory computer analysis which was applied to a network of observed winds. Hourly winds were analyzed by a random-to-grid interpolation scheme, and hypothetical particle trajectories were constructed by interpolation between hourly grid point wind vectors. Diffusion along undulating trajectories was accounted for by simulating a continuous source through serially released Gaussian puffs. A computer-produced graphic analysis was obtained for periods of a day, a season, and a year. Field results of the diffusion of a tracer released over a 3-hour period for a distance of 100 km agreed well the theoretical calculations considering that the latter were applicable to concentrations averaged over no more than an hour. The newly developed trajectory-diffusion technique appears to offer a more realistic alternative to commonly used methods for assessing the radiological doses of emissions from nuclear facilities up to distances of 50 mi. (Author abstract modified)

56318 **APTIC NO. 80386**

Winter, Valeria

THE INFORMATIONAL STUDY OF THE ATMOSPHERIC TURBIDITY. *(Studiu informational al opacitatii atmosferice). Text in Romanian. St. Cerc. Geol., Geofiz., Geogr., Ser. Geofiz., 11(2):231-253, 1973. 41 refs.*

The vertical perturbations of the direct solar radiation intensity intercepted at the ground was computed. Atmospheric turbidity was studied using both classical and informational methods. The observation data obtained by simultaneous comparative measurements carried out at two functional distinct points, placed in three different areas: industrial city, mountain region, and seashore were analyzed. The new algorithm permits a fast rigorous quantitative analysis and a precise determination of the value of each perturbing factor action.

56319 **APTIC NO. 80593**

Zuccaro-Labellarte, G.

A NUMERICAL MODEL FOR THE STUDY OF DISPERSION OF RADIOACTIVE POLLUTANTS IN AIR. *International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 311-318. 5 refs. (Nov. 12-16.)*

A numerical model for the study of the dispersion of instantaneous and continuous emissions of radioactive pollutants from elevated sources is described. The model calculates the pollutant concentration for any point as a function of time for instantaneous emissions and the average yearly concentration for any point in the case of continuous emissions. Input data are: height and temperature of the released material, discharge rate, wind speed and direction, atmospheric stability, and morphological features in the area under examination. The model can be used to determine the maximum dischargeable amount of each radionuclide based on the maximum permissible concentration in the air. The model is also provided with a multiple inversion subroutine to account for the effect of the presence of an inversion layer on the ground level concentrations. The model is computerized and written in FORTRAN IV. (Author abstract modified)

1972

56320 **APTIC NO. 79875**

Catton, I., R. L. Perrine, J. Waggoner, J. Dias, and A. Wassel

PUBLIC HEALTH RISKS OF THERMAL POWER PLANTS. APPENDIX II. POLLUTAN PATHWAYS. *California Univ., Los Angeles, School of Engineering and Applied Science, Rept. UCLA-ENG-7242, 79p., May 1972. 48 refs.*

Estimates of the concentration of a pollutant using the Gaussian bivariate distribution function are discussed. The basic procedures to be used in making dispersion estimates are outlined, including diffusion equations, estimates of diffusion coefficients, effective height of emission, inversion breakup fumigation, plume trapping, precipitation scavenging, and effect of emission time. There is now no method for analyzing the risks associated with an accident under conditions that produce air pollution episodes. The longest known episode for a particular area should be used in nuclear power plant design. Water pollution and transport by food chains and webs are also considered.

56321 **APTIC NO. 73502**

Karol, I. L.

RADIOISOTOPES AND GLOBAL TRANSPORT IN THE ATMOSPHERE. *(Radioaktivnye izotopy i global nyi perenos v atmosfere). Leningrad, Gidrometeoizdat, 1972, 316p. Translated from Russian by H. Olaru, Israel Program for Scientific Translations, Jerusalem, 1974. 370 refs.*

NTIS: TT 74-50025

Concepts of global circulation and radioactive aerosol removal in the troposphere and stratosphere are presented in the form of a single model that estimates the air-mass transport characteristics in different parts of the atmosphere, the global spread of contaminants from local sources, and the planetary concentration fields of some natural radioisotopes. The model predicts that radon-222 in the free atmosphere of temperate northern latitudes increases and that polonium-210 decreases with increasing vertical transport intensity. The lead-210 and polonium-210 content of the southern hemisphere appear to increase directly with the intensity of interlatitudinal exchange. Sodium-22 and beryllium-7 in the lower atmopshere and in fallout increase directly with the vertical transport intensity of the troposphere and with the interlatitudinal large-scale turbulent transport in the tropical lower stratosphere. Measurements of these isotopes in various places can serve as an indicator of the intensity of the pertinent transports and for determining their characteristic parameters.

1971

56322 **APTIC NO. 80876**

Bryson, Reid A

CLIMATIC MODIFICATION BY AIR POLLUTION. *Wisconsin Univ., Madison, Inst. for Environmental Studies, Int. Conf. Environ. Future Proc., 1st, Finland, 1971, p. 133-177. 20 refs. (June 27-July 3.)*

Some aspects of the effects of air pollution on climate are considered on the metropolitan, regional, and global scales. The emphasis is on those pollutants which are identifiable as important causal factors, and primarily on the standard climatic parameters. More heat is available in cities to heat the air than in the country, while apparently less heat is reradiated through turbid city air. Because of the heat island, the city develops a distinctive air circulation pattern very much like a sea breeze on an island, except that it does not reverse at night. Air turbidity tends to be highest in the middle of the heat island. The glare of scattered sunlight is great in dusty regions. A simple experiment involving grazing by goats in India indicates that overuse of the land can apparently change regional climates even without mechanization and industrialization. The observed climatic variation of the past century and its causes are considered. Temperature, the greenhouse effect, the role of dust, and radiation are discussed. The most important factor in climatic change on the scale of a century is the injection of dust into the atmosphere by volcanoes, but the climatic role of man in the next century could be greater than that of volcanoes. Local climate changes may be quite different from the global average. Changing human habits may benefically change their climatic effect.

1949

56323 **APTIC NO. 73527**

Fletcher, Robert D.

THE DONORA SMOG DISASTER - A PROBLEM IN ATMOSPHERIC POLLUTION. *Weatherwise, 2(3):56-60, June 1949.*

The meteorology during the Donora Smog disaster lasting from October 26 to October 31, 1948 is reviewed. Donora which lies in a deep and narrow valley of thee Monongahela River about 20 mi south-southeast of the heavily industrialized Pittsburgh area is particularly susceptible to local concentration of smoke and gaseous pollutants. On October 26, 1948, an eastern-seaboard storm receded and was replaced by a polar anticyclone advancing from the west. During the day, a high became established and remained approximately in the same position for 5 days. A surface inversion formed on this day and persisted until the 31st. Fog formation also occurred during the period. A wind parameter graph, constructed by averaging the reciprocals of the recorded wind for each hour of the day, showed a remarkable correspondence with a stability graph for the critical period. Thus, the unfavorable topographical characteristics of Donora in combination with the prevailing wind patterns and atmospheric stability conditions allowed for the entrapment of pollution emitted from the nearby industrialized region.

BASIC SCIENCE AND TECHNOLOGY

1976

56324 **APTIC NO. 80813**

Shelef, M., R. A. Dalla Betta, and K. Otto

BARIUM RUTHENATE: A SINK FOR GASEOUS MOLECULES. *J. Inorg. Nuclear Chem., 38(1):99-101, 1976. 11 refs.*

Barium ruthenate (BaRuO3) was prepared by reacting a stoichiometric mixture of barium peroxide and powdered ruthenium metal at 1100 C. Hydrogen uptake was measured in a constant volume system equipped with a pressure gauge. The BaRuO3 absorbed hydrogen at room temperature at least to the extent of HO.3BaRuO3. The product is analogous to the hydrogen tungsten bronzes (HxWO3). The formation takes place at room temperature using gaseous H2, without an external catalyst. Partially reduced BaRuO3 does not absorb hydrogen at room temperature but can incorporate nitric oxide into the bulk to give a mixed nitroxide-oxide. (Author abstract modified)

56325 **APTIC NO. 81023**

Wolf, Dieter and Joerg F[illegible]rbach

GAS FILTER TEST - THEORETICAL CONSIDERATIONS CONCERNING COLLECTION EFFICIENCY OF ADSORBENTS. *(Gasfilterpruefung-theoretische Ueberlegung zur Abscheideleistung von Adsorbenzien). Text in German. Staub, Reinhaltung Luft, 36(1):39-43, Jan. 1976. 9 refs.*

The binding forces by which molecules from the gas phase (adsorbates) are bound by sorption to solid bodies or absorbents, are of a physical and chemical nature. In the case of physisorption, the physical binding forces prevail, and in the case of chemisorption, the chemical binding forces. For expressing the absorbates-adsorbent binding forces the values for the thermodynamic state are less suitable than the characteristic values from the range of molecular structure, such as electron polarizability and electric dipole momentum of the adsorbate molecule. By means of binding forces and with the energy balance taken into consideration, the general aspects of gas filter testing, such as test gas concentration, type of test gas, and penetration, are discussed.

1975

56326 **APTIC NO. 80704**

Ahmadi, Goodarz

STABILITY OF MEAN TURBULENT FLOWS. *Phys. Fluids, 18(11):1582-1583, Nov. 1975. 6 refs.*

The stability of mean turbulent motion is studied via energy method. Several restrictions on the Reynolds stress tensor are derived to insure the stability of mean motion. The classical models of Boussinesq and Prandtl are considered and estimates of eddy viscosity and mixing length are obtained. (Author abstract)

56327 **APTIC NO. 73439**

Arakawa, Tsuyoshi, Yusaku Takita, Noboru Yamazoe, and Tetsuro Seiyama

CATALYTIC REDUCTION REACTION OF NO, PART III, NO-NH3 REACTION BY TRANSITION METAL NITRIDE CATALYSTS. *(No no sesshoku kangen bunkai hanno, III, seni kinzoku chikkabutsu shokubai ni yoru NO-NH3 hanno). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 494, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 3K41.)*

The catalytic activity of metal nitrides for nitric oxide reduction reaction with ammonia was measured and compared with the activity of metal oxide catalysts. The metal nitrides examined are chromium nitride, copper nitride, zinc nitride, iron nitride, manganese nitride, vanadium nitride, silicon nitride, and boron nitride. The sample gas composed of NO, NH3, and helium was flown through the catalyst bed at rates of 0.9, 0.6, and 28.5 ml/min respectively and the gas analyses were made by gas chromatography. The activity of Fe2N and Zn3N2 was higher than that of corresponding metal oxides, and Fe2N showed its activity at low temperature. The VN and Cu3N activities were comparable to their corresponding metal oxide activities; however, the CrN activity was smaller than its oxide activity. The order of increasing temperature at which 10% NO conversion occurred by metal nitride catalysts (thus decreasing catalytic activity) was Fe2N, Cu3N, VN, CrN, Zn3N, Si3N4, and BN, which was the same order observed in metal oxide activities (except iron catalyst).

56328 **APTIC NO. 80739**

Azoury, P. H. and S. M. Hai

COMPUTERIZED ANALYSIS OF DYNAMIC PRESSURE EXCHANGER SCAVENGE PROCESSES. *Proc. Inst. Mech. Engrs. (London), 189(18):149-158, 1975. 23 refs.*

A hybrid computerized method for integrating the differential equations of unsteady one dimensional ideal gas flow is used to analyze the component scavenge processes of the dynamic pressure exchanger (d.p.e.) in a looped arrangement. These processes are employed to investigate the effect of the relative nature of the interacting gases on d.p.e. performance. A criterion of high performance is proposed in terms of the overall strength of the interface between the gases and their relative specific heat ratios. The criterion gives good agreement with theory when tested with experimental results obtained on two d.p.e. tests units. (Author abstract modified)

56329 **APTIC NO. 73215**

Azuma, Kenkoku and Naotoshi Matsunaga

ADSORPTION RATE OF NITROGEN DIOXIDE BY ACTIVATED GRANULAR CARBON. *(Ryushi kasseitan ni yoru nisanka chisso no kyuchaku sokudo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 801, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2007.)*

The adsorption efficiency of nitrogen dioxide by activated carbon was studied to measure the effect of particle size of carbon, gas velocity passing through the carbon column, and contacting time of NO2 per carbon particle. The most effective adsorption under the gas velocity was obtained with carbon particles of 4 mm diameter. The rate constant of NO2 adsorption was proportional to the gas velocity raised to the 0.8 power. Calculation indicated that 14 carbon atoms were needed to adsorb one NO2 molecule on the surface of activated carbon.

56330 **APTIC NO. 80987**

Bond, Geoffrey C., Leslie R. Molloy, and Martin J. Fuller

OXIDATION OF CARBON MONOXIDE OVER PALLADIUM--TIN (IV) OXIDE CATALYSTS: AN EXAMPLE OF SPILLOVER CATALYSIS. *Chem. Commun., vol. 19:796-797, Oct. 8, 1975. 4 refs.*

An example of spillover catalysis is described for the oxidation of carbon monoxide over palladium-tin (IV) oxide catalysts. Palladium-SnO2 catalysts are more active for CO oxidation than either Pd-silicon dioxide or SNO2, but are relatively inactive for ethylene (C2H4) hydrogenation. Grinding of Pd-SiO2 and SnO2 mixtures enhances CO oxidation activity by more than tenfold. The Pd induces activity on the SnO2 surface. (Author abstract modified)

56331 **APTIC NO. 80782**

Breakspere, Robert J., L. A. R. Hassan, and D. K. Roberts

ADSORPTION AND DECOMPOSITION OF NITROUS OXIDE ON GAMMA-IRRADIATED MAGNESIUM OXIDE. *J. Chem. Soc., 71(11):2251-2259, 1975. 31 refs.*

The decomposition of nitrous oxide was investigated over magnesium oxide at temperatures between 423 and 773 K with and without the influence of gamma irradiation. Initial pressures of 8.0 and 7330 newton/sq m (0.06 and 55 torr) of N2O were used. Measurements of the decomposition of 7330 newton/sq m of N2O in which the system was continuously gamma irradiated, indicated that two processes of activation energy of 148.8 + or - 5.0 kilojoule/ mole and 39.9 + or - 4.0 kilojoule/mole were operative above and below about 720 K respectively. The thermal catalytic decomposition of 7330 newton/sq m of N2O occurred over the complete temperature range 673 to 773 K with a value of the activation energy of 148.8 + or - 5.0 kilojoule/mole. The radiation catalytic process below about 720 K occurred via ionic intermediates, which were produced by the interaction of gaseous N2O molecules with radiation induced centers on the surface of the magnesia. Both the radiation catalytic decomposition above about 720 K and the unirradiated process probably occurred without an electronic transfer process. The low pressure (8.0 newton/sq m) thermal decomposition also proceeds via the ionic intermediate at temperatures between 423 and 553 K. Adsorption of N2O could be detected and unirradiated MgO between 77 and 294 K. The decomposition of these physically adsorbed species was induced on gamma radiolysis. The effect of preadsorbed oxygen was studied and postirradiation effects are discussed. (Author abstract)

56332 **APTIC NO. 80796**

Cheng, Lung and Warren G. Cross

PRODUCTION OF SINGLE LIQUID DROPS OF CONTROLLED SIZE AND VELOCITY. *Rev. Sci. Instr., 46(3):263-265, March 1975. 15 refs.*

High pressure water sprays are one of the chief methods employed to control dust in industrial operations. Detailed study of the behavior of liquid drops requires a method of generating single drops of controlled size and velocity. A technique for producing single drops of preselected size and velocity is described. The apparatus produces water drops ranging in diameter from 300 to larger than 600 micron with velocities ranging from 800 to 2000 cm/sec, but the ranges of these values can be extended by changing apparatus parameters. Particular attention has been given to the effect of apparatus parameters on drop velocity. (Author abstract modified)

56333 **APTIC NO. 80521**

Clyne, Michael A. A. and I. Stuart McDermid

MASS SPECTROMETRIC DETERMINATIONS OF THE RATES OF ELEMENTARY REACTIONS OF NO AND OF NO2 WITH GROUND STATE N4S ATOMS. *J. Chem. Soc. Faraday. Trans. I, 71(11):2189-2202, 1975. 28 refs.*

Kinetic studies of the reactions of nitric oxide and of nitrogen dioxide with nitrogen superscript 4 sulfur atoms were made using direct mass spectrometric detection of N atoms in a discharge flow system. The rate constant for the rapid reaction in which N + NO yields 2 + oxygen was determined with pseudo first order kinetic analysis. Its mean value is (2.2 + or - 0.2) times 10 to the -11 power cu cm per molecule per sec at 298 K, and an expression is given for the rate constant between 298 and 670 K. Similar kinetic studies of the N + NO2 reaction, using pseudo first order analysis with very large excesses of NO2, showed the rate constant for this reaction to be an order of magnitude less than the literature value. However, at lower values of the ratio of NO2 to N, much greater apparent rate constants for the N + NO2 reaction were obtained, similar to those found previously. These high values are attributed to a rapid catalytic cycle capable of removing both N atoms and NO2. No evidence was found from nitrous oxide yields in the N + NO2 reaction for any other reactive channel involving N + NO2. The results give a mean value for the rate constant for the N + NO2 reaction equal to (1.4 + or - 0.2) times 10 to the -12 power cu cm/ molecule/sec at 298 K. (Author abstract modified)

563.4 **APTIC NO. 80705**

Davis, J., P. C. Kepple, and M. Blaha

DISTORTED WAVE CALCULATIONS FOR MULTIPLY CHARGED NITROGEN AND OXYGEN. *J. Quant. Spectro. Radiative Transfer, 15(12):1145-1148, Dec. 1975. 9 refs.*

Distorted wave ([illegible]) calculations were performed for electron impact excitation for selected transitions in atomic nitrogen and oxygen in various ionization stages. A comparison of these calculations with an earlier semiclassical model in the weak coupling approximation (SCI) are in substantial agreement for transitions in which the principal quantum number remains unchanged. Transitions involving a change in principal quantum number are best described by the DW approximation. The SCI method provides better estimates provided a new cutoff is introduced that depends on an angular momentum weighted average involving both states of the transition. (Author abstract modified)

56335 **APTIC NO. 80712**

Duvvuri, M. S., S. P. Muh[illegible]kamp, K. Z. Iqbal, and J. R. Welker

THE PYROLYSIS OF NATURAL FUELS. *J. Fire Flammability, vol. 6:468-477, Oct. 1975. 3 refs. (Presented at the Combustion Institute, Technical Meeting, Spring, 1975, San Antonio, Tex., April 21-22, 1975.)*

The use of a kinetic model to study the rate of decomposition of natural fuels by thermogravimetric analysis is described. The basic assumptions are that of two or more components and that the individual components follow a course of decomposition that could be modeled by an Arrhenius kinetic expression. The kinetic parameters are extracted from thermogravimetric data by a least squares technique. The parameters are combined to predict the weight loss and weight loss rates of wood and foliage samples undergoing pyrolysis. The results are compared with experimental data. (Author abstract modified)

56336 **APTIC NO. 73528**

Eisenberg, Richard and Carol D. Meyer

THE COORDINATION CHEMISTRY OF NITRIC OXIDE. *Accounts Chem. Res., 8(1):26-34, Jan. 1975. 56 refs.*

The coordination chemistry of nitric oxide with metal complexes, especially metal carbonyls, is discussed, with particular emphasis on the use of metal catalysts forr the reduction of NO to less noxious products. A mechanistic evaluation of the catalytic reduction of NO by carbon monoxide using ethanolic solutions off rhodium trichloride indicates that the initial reduction of $RhCl_3$ in situ is a prerequisite for catalytic activity, with a complex anion consisting of Rh, Cl_2, and CO appearing to be the true catalyst in the $RhCl_3$ system. The reaction of the complex metal anion with NO alone leads to the stoichiometric evolution of carbon dioxide and nitrous oxide. Reformation of the anion complex under CO is accompanied by N_2O and CO_2 evolution. Both water and acid are required for maximum activity of the catalytic process, and several mechanistic possibilities are presented to account for this observation.

56337 **APTIC NO. 80780**

Felder, R. M., R. D. Spence, and J. K. Ferrell

A METHOD FOR THE DYNAMIC MEASUREMENT OF DIFFUSIVITIES OF GASES IN POLYMERS. *J. Appl. Polymer Sci., 19(12):3193-3200, Dec. 1975. 8 refs.*

A method is presented for determining the diffusivity of a gas in a polymer from the response to a step concentration change in a continuous flow permeation chamber. The outlined procedure has several advantages over techniques currently in use: it requires simple numerical integration rather than curve fitting; it utilizes the complete response, rather than a portion of the response which falls within the region of validity of a short time asymptotic solution of the diffusion equation; and it is applicable both to flat membranes and cylindrical tubes. An illustration of the method is provided by the measurement of the diffusivity of sulfur dioxide in a Teflon tube at several temperatures. (Author abstract)

56338 **APTIC NO. 80510**

Frost, P. and J. H. Thomas

THE REACTION BETWEEN HYDROGEN SULPHIDE AND NITROGEN DIOXIDE. *Combustion Flame, 25(2):213-217, Oct. 1975. 16 refs.*

The reaction between hydrogen sulfide and nitrogen dioxide was studied over the temperature range 448-528 K. The orders of reaction were determined by measuring the initial rates of a series of experiments in which the pressure of one reactant was kept at a constant value and that of the other varied, then plotting log (initial rate) against log (P reactant). An analysis of the products was in excellent agreement with the equation H_2S plus $3NO_2$ yields water and sulfur dioxide and 3 nitric oxide. This stoichiometry was confirmed by measuring the SO_2 at intervals during the course of the reaction.

56339 **APTIC NO. 80513**

Fuggle, J. C., T. E. Madey, M. Steinkilberg, and D. Menzel

PHOTOELECTRON SPECTROSCOPIC STUDIES OF ADSORPTION OF CO AND OXYGEN ON RU(001). *Surface Sci., 52(3):521-541, Nov. 1975. 40 refs.*

The adsorption and coadsorption of carbon monoxide and oxygen on a clean rubidium(001) single crystal was studied using X-ray induced photoelectron spectroscopy (XPS) and ultraviolet-induced photoelectron spectroscopy (UPS). The measured substrate and adsorbate core level binding energies and vala valence levels are discussed. The O 1s XPS peak intensity was used for kinetic studies of adsorption and coadsorption. Some studies of the angular dependence of adsorbate and substrate peak intensity ratios are presented. Data on the shifts of XPS peaks and changes in UPS spectra as a function of adsorbate coverage are included. (Author abstract modified)

56340 **APTIC NO. 73438**

Fujieda, Shigeaki, Takao Suga, and Takaharu Onishi

STUDY ON THE ADSORBED NITROGEN DIOXIDE SPECIES BY FOURIER TRANSFORMATION INFRARED EMISSION SPECTROSCOPIC METHOD. *(Furie henkan sekigai hako bunkoho ni yoru kyuchaku sanka chissoshu no kenkyu). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 432, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2K14.)*

The infrared emission spectra of nitric oxide adsorbed on gamma-alumina and ferric oxide is obtained using a Fourier Transformation IR spectrometer. Gamma-alumina or ferric oxide powder was sprayed on an aluminum plate, to which NO was adsorbed at room temperature. Strong IR emission spectra of NO were obtained by heating the aluminum plate up to 100 C and by taking the cumulative emission signals. Three emission peaks from the NO adsorbed on gamma-alumina were observed for the spectral region between 800 to 2000/cm. They were at 1590/cm (asymmetric stretching), 1300/cm (symmetric stretching), and 1260/cm (symmetric stretching), which were the same spectra observed in an IR absorption method. The thickness of the coated adsorbing material affected the emission spectra, and the self-absorption of the 1590/cm peak was observed when the gamma-alumina was sprayed in 4.6 mg/sq cm. The emission spectra of NO adsorbed on ferric oxide gave peaks at 1550/cm, 1225/cm, 1020/cm, and 648/cm when the aluminum plate was heated to 70 C. The technique is advantageous since low heating temperature can be used and high sensitivity is obtainable. Spectral resolution of 8/cm was used.

56341 **APTIC NO. 73332**

Fujimoto, Kaoru, Noriko Horii, Tsutomu Shikada, Hiroo Tominaga, and Taiseki Kunugi

AMMONIACAL REDUCTION OF NITROGEN OXIDES BY COPPER CATALYSTS. *(Do kei shokubai ni yoru chisso sankabutsu no ammonia kangen). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 793, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, Tokyo, Japan, April 1-4, 1975, Paper 1047.)*

Copper oxide catalysts for nitric oxide reduction reaction by ammonia were prepared from sodium aluminate and copper sulfate or copper nitrate by a precipitation method, and the activities of the prepared catalysts for the reaction were examined for the effect of the presence of sulfur dioxide and water. The sample gas consisted with 300 ppm NO, 450 ppm ammonia, and 5% oxygen. For the catalyst prepared from copper nitrate, the catalytic activity was weakened when 10% water was present in the sample gas and the system gave only 50% NO removal efficiency. The NO removal efficiency by the catalyst without the water present was more than 90% for reaction temperatures between 250 to 300 C, but the efficiency decreased at higher reaction temperatures above 300 C indicating that the catalyst catalyzed the oxidation of ammonia. The presence of SO2 in the sample gas did not affect the catalytic activity. The activity of catalyst prepared from copper sulfate was not weakened by the presence of SO2 or water. The NO removal efficiency obtained by this catalyst was more than 99% if a reaction temperature above 300 C was employed and no catalytic action for ammonia oxidation was observed.

56342 **APTIC NO. 73391**

Fujimoto, Kaoru, Tsutomu Shikada, Noriko Hori, Hiroo Tominaga, and Taiseki Kunugi

AMMONIACAL REDUCTION OF NITROGEN OXIDES BY VANADIUM CATALYST. *(Banajiumu kei shokubai ni yoru chisso sankabutsu no ammonia kangen). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 794, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 1048.)*

The effect of sulfur dioxide and water on the ammonia reduction reaction of nitric oxide by vanadium oxide catalyst is examined. The vanadium oxide catalyst was prepared from sodium aluminate and sodium metavanadate by a precipitation method and the catalyst was placed in a Pyrex reaction tube through which sample gas was blown. The composition of sample gas was 300 ppm NO, 450 ppm NH3, and 5% oxygen to which either 10% or 100 ppm water and either 10% or 100 ppm SO2 were added. A chemiluminescence NO/NOx analyzer was used. No interference by water nor SO2 on the vanadium catalytic activity was observed when a reaction temperature above 250 C was used and efficiency better than 99.8% NO removal was obtained.

56343 **APTIC NO. 80580**

Gallagher, P. K., D. W. Johnson, Jr., E. M. Vogel, and F. Schrey

EFFECTS OF THE PT CONTENT OF LAO.7PBO.3MNO3 ON ITS CATALYTIC ACTIVITY FOR THE OXIDATION OF CO IN THE PRESENCE OF SO2. *Mater. Res. Bull., 10(7):623-628, 1975. 9 refs.*

The effects of platinum content on the catalytic activity of a catalyst consisting of 0.7 moles of lanthanum, 0.3 moles of lead, 1 mole of manganese, and 3 moles of oxygen were investigated with respect to carbon monoxide oxidation in the presence of sulfur dioxide. The oxidation of CO in the presence of 50 ppm of SO2 increased with increasing Pt content. Crushed single crystals with Pt contents of 0-5200 ppm and polycrystalline materials with 0-2400 ppm Pt behaved qualitatively similar with respect to the oxidation of CO. As little as 200 ppm of Pt imparted a significant resistance to poisoning by SO2. (Author abstract modified)

56344 **APTIC NO. 80764**

Gyakushi, Nobuhiko, Masateru Shimotsu, and Tokio Koizumi

COMBUSTION RATE OF HIGH-SUPERCHARGED MIDDLE SPEED DIESEL ENGINE AND CO2 DENSITY DISTRIBUTION OF COMBUSTION GAS. *(Kokakyu chusoku diesel kikan no nensho seino to nensho gasu no CO2 nodo bunpu ni tsuite). Text in Japanese. Preprint, the Japan Society of Mechanical Engineers, Tokyo, p. 227-238, 11 refs. (Presented at the Japan Society of Mechanical Engineers, Lecture Meeting, Sendai, Japan, Oct. 11-12, 1975.)*

The effect of the shape of the fuel injection nozzle and changes of superpressure on combustion characteristics and carbon dioxide distribution were studied. A 4-cycle, direct injection type diesel engine was used for the study. The differences in the graphical heat efficiency with different shapes of fuel injection nozzle were found to result primarily from the difference in the combustion efficiency, and little from changes in the combustion speed. Increases of superpressure resulted in the improvement of heat efficiency due to an increase of combustion speed, but the concentration distribution of the combustion gas remained unchanged. The concentration distribution of the combustion gas during the exhaust stroke changed with respect to the shape of the injection nozzle and operating conditions. The most homogeneous concentration distribution was obtained when the injection angle was adjusted in such a way that injection pointed toward the top dead point of a piston. At the same measuring conditions and same load, the more homogeneous the concentration distribution was, the higher was the graphical heat efficiency.

56345 **APTIC NO. 80532**

Haber, J., K. Malysa, J. Pawlikowska-Czubak, and A. Pomianowski

STUDIES ON KINETICS AND MECHANISMS OF THE REACTION OF SULPHUR DIOXIDE AND NITROGEN OXIDES WITH GASEOUS AMMONIA. III. INFLUENCE OF WATER VAPOUR ON THE KINETICS AND THE MECHANISM OF THE REACTION. *(Einfluss des Wasserdampfes auf die Kinetik und auf den Mechanismus der Reaktion). Text in German. Z. Anorg. Allgem. Chem., 418(2):179-187, Oct. 1975. 8 refs.*

The kinetics and mechanism of the reaction of water, sulfur dioxide, nitrogen oxides, and ammonia were investigated. The reactions proceed faster and their yields are much greater in the presence of water vapor than reactions in mixtures of dry gases. Sulfur dioxide is oxidized in the presence of NOx and water vapor and forms stable ammonium sulfate after the addition of ammonia.

56346 **APTIC NO. 80707**

Hart, R., M. Nasralla, and A. Williams

THE FORMATION OF OXIDES OF NITROGEN IN THE COMBUSTION OF DROPLETS AND SPRAYS OF SOME LIQUID FUELS. *Combust. Sci. Technol., 11(1-2):57-65, 1975. 9 refs.*

The formation of nitric oxide and nitrogen oxides in the forward stagnation region of flames surrounding burning cylinders simulating the droplet combustion of n-heptane and ethanol is described and temperature profiles are given. Maximum yields of NO and NOx are situated towards the lean side of the maximum flame temperature. Considerable NO is formed near the liquid surface by a prompt-NO mechanism. The addition of fuel nitrogen in the form of pyridine enhances the level of NO but does not increase the amount of hydrogen cyanide formed. Measurements of NO in the spray combustion of gas oil and gas oil doped with pyridine and quinoline are made. With low levels of additives, 100% conversions of the nitrogen compounds to NO are obtained. (Author abstract modified)

56347 **APTIC NO. 80706**

Henriksen, K.

THE EFFECTIVE LIFETIME PROFILES OF THE O(1S) AND N2+ (B2 SIGMA U+, V EQUALS O) EXCITED SPECIES. *J. Atmospheric and Terrest. Phys., 37(11):1491-1495, Nov. 1975. 29 refs.*

The height variation of the effective lifetimes of the 1S state of atomic oxygen and (B2 sigma u+, v equals O) level of molecular nitrogen in the atmosphere are calculated. For the excited N2+ ions the half quenching height is at 48 + or - 4 km, giving the possibility of observing N2+ first negative band emissions below 50 km in relativistic particle events. The half quenching height of the O(1S) atoms varies between 85 and 115 km, depending on different values of the quenching rate coefficients and model atmospheres. Quenching has a different effect on the 4278 and 5577 A emission height profiles when auroral particles penetrate into and below the E region. (Author abstract modified)

56348 **APTIC NO. 80699**

Huebner, Russell H., R. J. Celotta, S. R. Mielczarek, and C. E. Kuyatt

ENERGY ABSORPTION BY N2O IN THE 4 TO 14 EV REGION. *J. Chem. Phys., 63(10):4490-4494, Nov. 15, 1975. 22 refs.*

Apparent oscillator strength values for transitions in the 4 to 14 eV region in nitrous oxide were derived from electron energy loss measurements. Detailed comparison with photoabsorption measurements in the ultraviolet region indicates a weak transition below the 1 delta arrow X bar 1 sigma + transition at 6.8 eV not observed optically. The analysis provides oscillator strength values in the region between 11.5 and 12.4 eV, where no quantitative photoabsorption data are available. (Author abstract modified)

56349 **APTIC NO. 79934**

Kasahara, Mikio, Kanji Takahashi, and Enyko Suzaki

AEROSOL FORMATION FROM THE PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE. IV. EFFECTS OF FOREIGN PARTICLES. *Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):129, 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., 3p (Presented at the National Conference on Air Pollution, 16th, Japan, Paper 8.)*

The effects of foreign particles on the photochemical formation of an aerosol of sulfuric acid are investigated in a mixture containin indoor air, which consists of clean air, sulfur dioxide, and foreig particles. Ultraviolet light was applied to a mixture of air and SO2, with known humidity and SO2 concentration, after foreign particles were added to it. Foreign particles such as aerosol particles in the atmosphere, lead and zinc particles, and stearic acid were used. The size distribution of the foreign particles was measured, and the particle number concentration of the foreign particles and the aerosol particles were determined. The initial stage of aerosol formation is slowed by the addition of foreign particles. However, as the time of exposure to the ultraviolet light increases, the slow down effect is decreased, and after a long exposure, the addition of foreign particles tends to increase the particle number concentration of aerosol particles. The restraining effect of foreign particles on aerosol formation in a mixture of indoor air and SO2 becomes remarkable after a long exposure to the ultraviolet rays. The particle number concentratio of newly formed aerosol particles in a system containing foreign particles strongly depends on the surface density of foreign particles.

56350 **APTIC NO. 80809**

Kasahara, Mikio, Kanji Takahashi, and Hironori Suzaki

AEROSOL FORMATION FROM THE PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE. IV. EFFECTS OF FOREIGN PARTICLES. *(SO2 no kokagakuteki sanka ni yoru earozoru seisei. (4). Gairai ryushi no eikyo). Text in Japanese. Preprint, Japan Society of Air Pollution, Tokyo, p. 271, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Japan, Nov. 5-7, 1975.)*

A study was conducted on the effects of foreign particles such as atmospheric aerosol, lead, zinc, stearic acid and dioctyl phthalate particles on aerosol formation attributed to the photochemical oxidation of sulfur dioxide. Foreign particles were added to mixture of atmospheric air and SO2, and purified air and SO2 at a controlled temperature and SO2 concentration. An ultraviolet ray was applied to the gas test material. Aerosol formation at the initial stage decreased considerably with the presence of foreign particles by tended to intensity the quantitative concentration of produced aerosol particles when the ultraviolet ray was applied for longer periods of time. The quantitative concentration of aerosol formation from the mixture of atmospheric air and SO2 was significantly curtailed by the presence of foreign particles, especially when ultraviolet ray was applied for long period of time. The quantitative concentration of newly formed aerosol particles from the air/SO2 mixture containing foreign particles depended on the surface area concentration of the foreign particles.

56351 **APTIC NO. 73252**

Kautz, K., H. Kirsch, and R. Singh Dev

CHEMISM AND MORPHOLOGY OF DUSTS FROM POWER PLANTS. *(Chemismus und Morphologie von Kraftwerksstaeuben). Text in German. VGB Kraftwerkstechnik, 55(3):180-187, March 1975. 10 refs.*

Preliminary results of a comprehensive study on the morphology and chemical composition of dusts emitted by different combustion equipment are presented. Dust particles separated from bituminous coal-fired power plant flue gases were formed of hollow aluminum silicate glass spheres with crystals of mullite, alpha-alumina, alkali chlorides, alkali sulfates, calcium sulfate, and iron silicates adhering to their walls. The aluminum silicate glass is composed mainly of silica, a small amount of alumina, iron oxides, alkaline earth metals, potash, and sodia. The spheres are sometimes filled with hematite, magnetite, and other oxides, and there may be carbon adhering to their surface. Dust particles collected from dedusted flue gas were mostly smaller than 10 micron, and 80% of these particles were smaller than 5 micron; the quartz, cristobalite, and tridymite content was lower than 1% by weight. Individual dust particles sometimes form aggregated flakes held together possibly by very thin layers of water and sulfur oxides. Dust particles in the flue gases of brown coal-fired power plants were composed of molten quartz and calcium sulfate, as well as silicate and ferrites. The particle size was usually larger than 10 micron. Particles in oil-fired equipment flue gases are composed mainly of oil coke, and contain nickel and vanadium. Waste incinerator-generated dust shows an enrichment of sulfites, chlorine, zinc, lead, copper, and cadmium, and a reduction of the silicon, aluminum, barium, and strontium contents following dust separation relative to the raw gas.

56352 **APTIC NO. 73250**

Knotkova-Cermakova, D., J. Kosobud, J. Vlckova and J. Honzak

UNIVERSAL ACCELERATED WEATHERING CABINET FOR WEATHERING TESTS OF METALS AND PROTECTIVE COATINGS. *(Eine universelle Einrichtung fuer die Pruefung der atmosphaerischen Korrosion von Metallen und Schutzueberzuegen). Text in German. Werkstoff Korrosion, 26(2):118-123, 1975. 14 refs.*

A new weathering testing facility for accelerated corrosion tests is described. The cabinet is composed of a horizontal copper cylinder with an organic glass cover for visual observation of the specimens. The temperature can be controlled between 0 and 50 C by air and water currents, and the relative humidity can be varied between 50 and 95%. Aggressive additions, such as sulfur dioxide, aerosols, salt sprays, and dilute sulfuric acid, are introduced through a spray system. The amount of the SO2 with which the metal surface of the specimen is in contact varies between 100 and 800 mg/sq m/day. The surface electrolyte is generated by condensation. The thickness of surface electrolytes on vertical surfaces did not exceed 50 micron. Rapid, possibly catalyzed, oxidation of SO2 to sulfate ion was observed in the surface layer of the electrolyte containing water-soluble corrosion products.

56353 **APTIC NO. 73286**

Kuronuma, Haruo and Hisao Imai

CATALYTIC REDUCTION REACTION OF NITROGEN MONOXIDE BY AMMONIA. *(Issanka chisso no anmonia ni yoru sesshoku kangen hanno). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 797, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2003.)*

The catalytic activity of platinum metal on nitric oxide reduction by ammonia is studied. The composition of sample gas used was NO-NH3-helium gas with a molar % ratio of 1 to 1 to 98 respectively and it was blown through the Pt catalyst layer. The effluent gas was analyzed by gas chromatography using Porapack-Q and Molecular Sieves-13X. The Pt catalyst started showing its high catalytic activity around 250 C, and a rapid decrease in NO and NH3 concentrations in the effluent gas was observed above this reaction temperature. The formation of nitrous oxide increased until NO gas diminished in the effluent gas, which indicated the the reaction between NO and NH3 leading to N2O is much faster than the reaction between N2O and NH3. Under the conditions of the flowing sample gas at 1 g hr/mole and the reaction temperature at 275 C, no NO was detected in the effluent gas, and 0.3 molar % N2O, 0.55 molar % N2, and 0.55 molar % NH3 were present in the effluent gas.

56354 **APTIC NO. 73346**

Kususaka, Takashi, Masayuki Yamada, Tsuneo Shirai, and Saburo Yanagisawa

DENITRIFICATION METHOD BY REDUCED COPPER CATALYST. *(Kangen do shokubai ni yoru dasshoho). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 798, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2004.)*

The reduction of nitric oxide to nitrogen by carbon monoxide and copper metal loaded on alumina is studied. Two different reducing agents (Cu and CO) are employed for the No reduction and the denitrification was more effective than when either of agents was used alone. When 280 ppm NO gas in nitrogen was blown through the copper catalyst layer which was prepared by applying copper nitrate solution to alumina, heating, and then reducing under CO atmosphere to make reduced copper catalyst, the NO reduction started at 200 C and 95% of NO reduction was achieved by further heating up to 300 C. When 4500 ppm CO gas was added to the same system, the No reduction started at 50 C and 95% NO reduction was achieved before the reaction temperature reached to 100 C.

56355 **APTIC NO. 88531**

Law, C. K.

A THEORY FOR MONODISPERSE SPRAY VAPORIZATION IN ADIABATIC AND ISOTHERMAL SYSTEMS. *Intern. J. Heat Mass Transfer, 18(11):1285-1292, Nov. 1975. 10 refs.*

The motion and the associated phenomena of a monodisperse spray undergoing evaporation in an isothermal or adiabatic gas stream are investigated theoretically. Particular emphasis is placed on initially cold flows that may lack sufficient energy to achieve complete spray vaporization. Expressions are derived for the special variations of droplet velocity and size, the gas velocity and temperature, and a criterion on the initial conditions for complete spray vaporization. The relative importance of various factors affecting rapid vaporization over short distances are discussed. The temperature of the droplets remains constant during their motion, fine atomization is a key factor for achieving fast vaporization of the spray, and for rapidly and slowly vaporizing droplets the value of the distance over which complete vaporization occurs depends on the injection velocity and the inlet gas temperature, respectively. A significant reduction in the chamber length can be achieved by aiming to vaporize most, but not all of the spray.

56356 **APTIC NO. 88577**

MacIntyre, Ferren

NON-LIPID-RELATED POSSIBILITIES FOR CHEMICAL FRACTIONATION IN BUBBLE FILM CAPS. *J. Rech. Atmospheriques, 8(3-4):515-527, July-Dec. 1974. 33 refs.*

Problems associated with determining the mechanisms of chemical fractionation in oceanic film caps are described. Published laboratory fractionation data are suspect if the surface is not clean and if 0.1% reproducibility is the operational test of surface cleanliness; or if the surfactants used in model studies are unlike oceanic surfactants. Oceanic film caps are stabilized by a class of surfactants (wet) unlike the familiar lipids (dry surfactants). Wet surfactants reside in the water phase and attach to the surface by occasional hydrophobic groups. Their behavior, including fractionation effects, is fundamentally different from that of dry surfactants. Possible mechanisms of non-surfactant-induced fractionation in film caps include: fractionation within the film cap itself; fractionation at the exterior surface; and fractionation during formation of the film cap.

56357 **APTIC NO. 88516**

McDowell, C. A., F. G. Herring, and J. C. Tait

ELECTRON PARAMAGNETIC RESONANCE STUDY OF HYDROGEN AND FLUORINE ATOM ADDITION TO SO2. *J. Chem. Phys., 63(8):3278-3283, Oct. 15, 1975. 25 refs.*

The electron paramagnetic resonance spectrum of the species formed in the near ultraviolet photolysis of mixtures of argon or krypton containing 1% hydrogen iodide and sulfur dioxide, 1% CF3OF and SO2, or F2SO2 was investigated at 4.2 K. The species formed when an HI/SO2 mixture is photolyzed was the symmetric sigma radical HSO2. The assignment of the principal components of the g and hyperfine tensors is aided by observation of preferential orientation of the trapped radical. The species formed when a CH3OF/SO2 mixture was photolyzed in the far ultraviolet was the symmetric sigma radical FSO2. The g and A tensors were determined from an exact solution of the spin Hamiltonian assuming a noncollinear tensor axis system. (Author abstract modified)

56358 **APTIC NO. 89961**

Miura, Hiroshi, Yutaka Morikawa, and Takayasu Shirasaki

MOBILITY OF LATTICE OXYGEN DURING CATALYTIC OXIDATION OF CARBON MONOXIDE ON MOLYBDATE CATALYSTS. *(Issanka-tanso no sanka hanochu ni okeru moributenkei sankabutsu shokubai no koshi-sanso no idosei). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 11:1875-1877, 1975. 5 refs.*

The oxidation of carbon monoxide with molecular oxygen 18 on bismuth, cadmium, nickel, and lanthanum molybdate catalysts was investigated by measuring the atomic oxygen 18 concentration in carbon dioxide. The distribution of 018 concentration was in good agreement with the value calculated on the assumption that the isotopic mixing is very rapid. It is suggested that the 018 concentration in the products is close to that on the catalyst surface. Change in 018 concentration was plotted against the amount of CO2 formed. The increase of 018 concentration was slow in the case of beta, gamma bismuth molybdenum oxide and lanthanum molybdenum oxide, whereas that of gamma bismuth molybdenum oxide, calcium molybdate, and nickel molybdate was rather rapid. Probably the lattice oxygen in the former group is mobile, and is immobile in the latter. The former group has a layered type structure with bismuth dioxide ions (Bi2O2++)n or lanthanum dioxide ions (La2O2++)n layer. This layer contains lattice oxygen that has no bonding with molybdenum(6+) ions. The member of the latter group has no such lattice oxygen. The mobility of lattice oxygen is attributed to the layer structure like (Bi2O2++)n layer. (Author abstract)

56359 **APTIC NO. 73248**

Miyadera, Tatsuo, Misao Kawai, Shinzo Hirasawa, Kunio Miyajima, Masaaki Oyama, Nobuo Kido, Masakazu Yamazaki, Hisao Hattori, and Hiroshi Kobayashi

OXIDATION OF NO BY METAL OXIDE CATALYSTS. *(Kinzoku sankabutsu shokubai ni yoru NO no sanka).*

Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 799, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2005.)

The nitric oxide oxidation to nitrogen dioxide was studied using several metal catalysts. A gas mixture of 700 to 800 ppm NO, 4.0% oxygen, and balance nitrogen was flown through each catalyst layer and the effluent NO2 was measured by chemiluminescence. The conversion % of the reaction was examined as a function of reaction temperature. The conversion efficiency increased with increasing temperature, however it decreased with temperature beyond a certain temperature owing to the reverse reaction of NO2 to NO at higher temperature. Metal oxides of manganese, cobalt, chromium, and nickel gave high activity for the reaction and their conversion % were 80%, 80%, 50%, and 58% respectively under the suitable temperatures for each reaction system which were between 300 C to 400 C. Catalytic activity of noble metal oxides was small, and no activity was observed from titanium, zinc, lead, molybdenum, vanadium, and wolfram catalysts. The increased reaction time during which NO molecules remain in contact with catalysts gave only a slight increase in the conversion efficiency, therefore lowering the gas flow rate was not very advantageous.

56360 **APTIC NO. 80515**

Moreau, Richard A., S. C. Sorenson, and W. L. Hull

A TECHNIQUE FOR TIME RESOLVED NITRIC OXIDE MEASUREMENTS IN AUTO-IGNITING MIXTURES. *Combustion Flame, 25(2):197-205, Oct. 1975. 17 refs.*

A technique was developed to determine the formation rate of nitric oxide in combustion gases using a rapid quench. Studies were performed in a rapid compression machine with a thin diaphragm connecting the combustion chamber and a quenching chamber. Time bursting of the diaphragm permitted determination of the NO history for an auto-igniting heptane-air mixture. Good agreement was obtained between experimental results and kinetic calculations using the extended Zeldovich mechanism. Effects of compression ratio and equivalence ratio on frozen NO concentrations were determined. Final values of NO were not dependent on compression ratio, but were strongly dependent on air/fuel ratio for this combustion system. The NO formation was a non-equilibrium process. Heat transfer effects were approximated by an overall heat transfer coefficient model, which gave results comparable to known data for engine operating cycles. Heat transfer had a limiting effect on NO concentrations.

56361 **APTIC NO. 73436**

Nijima, K., K. Fukaya, S. Fukui, and S. Sugano

STUDIES ON PHOTOCHEMICAL POLLUTION, PART I. FORMATION OF GLYOXALS BY PHOTOCHEMICAL CLEAVAGE OF AROMATIC HYDROCARBONS. *(Kokagaku kogai no kenkyu, dai 1-ho, hokozoku tankasuiso no kokagaku teki kairetsu ni yoru guiriokisaru rui no seisei). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.) no. 6:45, Feb. 1975.*

Photochemical reactions of benzene, toluene, o-xylene, m-xylene, and p-xylene with nitric oxide were induced under a xenon lamp. To 1000 microliters of each hydrocarbon in a quartz cell 0, 50, 100, or 700 ppm NO was added. After the reaction cell was irradiated by the lamp for 1, 3, and 5 hr, the produced acrolein and glyoxals were determined. Acrolein was determined by the 4-hexylresorcinol method and glyoxals were determined by gas chromatography after compounds were reacted with 4-chloro-o-phenylenediamine. The NO reaction with benzene gave all of these compounds. The toluene, o-xylene, m-xylene, and p-xylene reactions gave a large amount of methylglyoxal indicating cleavage of the benzene ring. Biacetyl was detected as a product of the o-xylene reaction.

56362 **APTIC NO. 80816**

Rice, Richard W. and Gary L. Haller

INTERNAL REFLECTION SPECTROSCOPY OF ADSORBED MOLECULES ON METAL FILMS: CARBON MONOXIDE ON PALLADIUM. *J. Catalysis, 40(2): 249-254, Nov. 1975. 18 refs.*

A brief discussion of the advantages and problems experienced in the study of adsorption on metal films using infrared internal reflection spectroscopy (IRS) is given. The structure of adsorbed carbon monoxide on palladium was examined using polarized IRS. Adsorbed carbon monoxide which gives rise to infrared bands above 2000/cm are structure insensitive while those species that absorb below 2000/cm are structure sensitive. The species which forms with a heat of adsorption greater than 40 kcal/mole and absorbs at less than 1800/cm may involve bonding of both carbon and oxygen to palladium atoms on a low index face. (Author abstract)

56363 **APTIC NO. 80703**

Rieger, T. F., K. S. Tait, and H. R. Baum

ATMOSPHERIC INTERACTION RADIATION FROM HIGH ALTITUDE ROCKET EXHAUSTS. *J. Quant. Spectro. Radiative Transfer, 15(12):1117-1124, Dec. 1975. 9 refs.*

A model for calculating the infrared radiation from rocket exhaust gases at high altitudes caused by collisions between exhaust molecular species and atmospheric species is presented. At altitudes where the atmospheric mean free path is larger than a typical rocket exhaust plume length scale, the evolution in space and time of the exhaust gases is described by the kinetic theory of gases. The collision frequency between exhaust and atmospheric species is sufficiently low that excited molecules have time to lose this excitation energy via radiative emission before experiencing another collision. The distribution of excited molecular states is nonthermal in this model. Two examples of such radiation are presented, for the radiation from the carbon dioxide (v3) mode and the other for the water (v3) mode. The atmospheric collision partner for excitation of both of these exhaust species is taken to be atomic oxygen, the dominant atmospheric constituent at high altitudes. (Author abstract modified)

56364 **APTIC NO. 80746**

Satterfield, Charles N., Michael Modell, and Jerome F. Mayer

INTERACTIONS BETWEEN CATALYTIC HYDRODESULFURIZATION OF THIOPHENE AND HYDRODENITROGENATION OF PYRIDINE. *Am. Inst. Chem. Engr. J., 21(6):1100-1107, Nov. 1975. 28 refs.*

Interactions between catalytic hydrodesulfurization of thiophene (HDS) and hydrodenitrogenation of pyridine (HDN) were investigated. There is a thermodynamic limitation on the first step of the HDN reaction mechanism which occurs at 5-11 bars at temperatures above 350 C. Pyridine inhibits the HDC reaction, but sulfur compounds have a dual effect on HDN. At low temperatures, thiophene inhibits the reaction by competing with pyridine for hydrogenation sites on the catalyst. This retards the hydrogenation of pyridine to piperidine, reducing the overall reduction rate. At high temperatures the dominant effect is interaction of hydrogen sulfide, an HDS reaction product, with the catalyst to improve its hydrogenolysis (hydrocracking) activity. This increases the rate of piperidine hydrogenolysis, which is rate determining at the latter conditions, and enhances the overall rate of HDN. (Author abstract modified)

56365 **APTIC NO. 73290**

Shimada, Isamu

AUTOMOTIVE EXHAUST GASES AND PHOTOCHEMICAL SMOG. *(Jidosha haishutsu gasu to kokagaku sumoggu). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(6):18-31, Feb. 1975. 8 refs.*

Fairly comprehensive experiments on photochemical smog formation from automotive exhaust gases were conducted in a smog chamber. Photochemical reactions in systems containing hydrocarbon (HC) and nitrogen oxides (NOx) were investigated. Various influences were examined: HC and NOx concentrations; temperature; humidity; photochemical reactivities of HC; and formation of formaldehyde, acrolein, and peroxyacetyl nitrate (PAN) and other peroxy compounds. The efficacy of the air-injection purification system was tested; suppression of aldehyde and oxidant formation was discerned. Photochemical reactions in the system (hydrocarbon- nitrogen oxides-sulfur dioxide) were investigated; a definite relationship was found between accurate values of sulfur dioxide concentrations and corrected oxidant concentrations. The system of propylene-nitrogen oxide (NO)-sulfur oxide was investigated; photochemical reactions were influenced by humidity. Computer simulations of low-concentration photochemical reactions are suggested for further investigation.

56366 **APTIC NO. 80810**

Suzuki, Shin, Noritoshi Horiuchi, Hiroo Takagi, and Wataru Ando

PHOTOCHEMICAL REACTION WITH SO2 AND ORGANIC COMPOUNDS. VI. *(Aryusan gasu to yuki kagobutsu tono kokagaku hanno. VI). Text in Japanese. Preprint, Japan Society of Air Pollution, Tokyo, p. 270, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Japan, Nov. 5-7, 1975.)*

Aldehyde (or Ketone), which is a photochemical reaction product of sulfur dioxide, cis-2-butane, and dioxide group, was investigated using the GC-DNPH method and infrared spectrometry in conjunction with the investigation of liquid substances using the FPD, GC-EI-MS, GC-CL-Ms processes. A reaction container (approximate 100 cc) of hard glass was depressurized down to 0.001 mm Hg, into which SO2, cis-2-butane, oxygen and diluted helium gas were introduced. The pressure inside the container increased to one atmosphere, and a 450W high voltage mercury lamp was applied to the reaction container. Aldehydes of C2, C3 and C4 were detected as photochemical reaction products by the GC-DNPH method, of which C2 was determined to be acetaldehyde. Infrared spectrometry also indicated that the carbonyl group derivatives increased in proportion to the increase in the length of time the light was applied. In addition, analysis of the liquid reaction products using the FPD process detected 4 peaks of more than 47, and one of the products was confirmed to have a molecular weight of M/e equals 106 by the GC-EI-MS and GC-CL-MS processes.

56367 **APTIC NO. 79937**

Takahashi, Kanji, Mikio Kasahara, and Masayuki Ito

AEROSOL FORMATION FROM THE PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE. V. EFFECTS OF IONS. *Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):130, 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., 3p. (Presented at the National Conference on Air Polllution, 16th, Japan, Paper 9.)*

The effect of ions on the formation of sulfuric acid mist was studied by introducing a radiative source of Krypton 85 into an experimental chamber. Three stage diffusion analysis was used. No significant mutual interactions of ion concentration and relative humidity or sulfur dioxide concentration were observed. The densit of ions in the chamber was about 10 to the 6th power ions/cu cm. The average experimental increase in aerosol formation due to the presence of ions was 6 times 10 to the 4th power particles/cu cm, which agrees well with the calculated result. The effect of ions o the formation of sulfuric acid mist of usual densities was less tha about 10%.

56368 **APTIC NO. 73334**

Takayasu, Masami, Kyoichi Kanzaki, Katsumi Takano, Yoshiaki Annen, and Yoshiro Morita

CATALYTIC REACTION OF NO, PART 7, INFLUENCE OF CO-EXISTING GASES ON NH3 REDUCTION. *(NO no sesshoku hanno, 7, NH3 kangen ni okeru kyozon gasu no eikyo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 796, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2002.)*

The catalytic reduction of nitric oxide by ammonia was studied using several metal catalysts. The metal catalysts used were the nitrate salts except for platinum, in which platinum chloride was used, and each metal salt was loaded on a gamma alumina bed in the ratio of 1 to 9. A gas mixture of NO 500 ppm and NH3 500 ppm balanced in nitrogen gas was passed through the catalytic bed and the NO concentration in the gas mixture at the bed effluent was measured. When the copper catalysts were pretrrated with 500 ppm sulfur dioxide for 100 min, the catalytic action of copper for the NO reduction reaction weakened compared to the catalytic action of fresh copper. However when 10% oxygen was present in the NO-NH3 gas mixture, this effect was not observed. For the platinum catalyst, no catalytic action was obtained when the catalyst was pretreated with SO2, but the pretreated catalyst gave catalytic action under the presence of oxygen in the sample gas. When the sample gas containing NO, NH3, O2, and SO2 was used, an even higher catalytic action was obtained with platinum, chromium, and vanadium catalysts; however, no such effect was observed with copper catalyst.

56369 **APTIC NO. 73396**

Takayasu, Masami, Yoshiaki Annen, Koichi Ando, Kyoichi Kanzaki, and Yoshiro Morita

CATALYTIC REACTION OF NO, PART 6, INFLUENCE OF CO-EXISTING GAS ON THE CATALYTIC OXIDATION. *(NO no sesshoku hanno, 6, sesshoku sanka ni okeru kyozon gasu no eikyo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 795, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2001.)*

Effects of sulfur dioxide, water, and carbon dioxide on the catalytic oxidation reaction of nitric oxide are studied. The sample gas containing 500 ppm NO, 5% oxygen, and interfering gases was flown through the catalyst layer, and its effluent was analyzed by a chemiluminescence nitrogen oxides analyzer to determine the conversion efficiency of NO. When SO2 was added to the sample gas, the activity of platinum catalyst for the NO oxidation reaction was poisoned; however, the poisoned Pt catalyst could be regenerated by heating at 500 C for 30 min in nitrogen atmosphere. The effect of water on the Pt catalytic action was not great, but the 63% NO conversion efficiency without the presence of interfering gases decreased to 53.8% with 0.92 vol% water in the sample gas. No CO2 effect on the NO catalytic reaction was observed from the highly active catalysts such as cobalt, chromium, and platinum.

56370 **APTIC NO. 73440**

Takizawa, Y., K. Minagawa, R. Kurayama, and I. Nakamura

PHOTOCHEMICAL FORMATION OF METHYL MERCURY IN THE ATMOSPHERE. *(Taiki kankyo ni okeru mechiru suigin no kokagaku teki seisei narabi ni sono henka). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 30(1):160, April 1975. (Presented at the Japan Society for Hygiene Annual Meeting, 45th, Kyoto, Japan, April 1975, Paper 308.)*

The photochemical formation of methyl mercury and ethyl mercury in the reaction of mercury vapor with acetic acid, propionic acid, ethyl acetate, ethanol, ethyl ether, methane, acetonitrile, methyl isobutyl ketone, trimethyl benzene, acetaldehyde, methyl propionate, and acetone were studied using a mercury lamp (300-500 nm), black lamp (366 nm), sterilizing lamp (253.7 nm), and sunlight. Alkyl mercuries were analyzed by gas chromatography with an electron capture detector. The mercury lamp produced methyl mercury from acetic acid, propionic acid, acetontrile, and acetoaldehyde. The black lamp produced methyl mercury from acetic acid, propionic acid, acetaldehyde, and acetone. No ethyl mercury was produced by the mercury lamp and black lamp. Methyl mercury was produced from all the compounds tested using the sterilizing lamp which also produced ethyl mercury from propionic acid, methane, and acetonitrile. Sunlight produced methyl mercury from acetic acid, acetonitrile, and acetoaldehyde.

56371 **APTIC NO. 73455**

Tanikawa, Noboru, Kohei Urano, and Yoshitaka Kobayashi

ADSORPTION CHARACTERISTICS OF NOX BY ACTIVATED CARBON. *(Kasseitan ni yoru NOx no kyuchakusei). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 800, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 2006.)*

The adsorptivity of nitrogen oxides on activated carbon is studied for the initial adsorption rate, effects of temperature, oxygen, and water, and adsorbed amount at equilibration. The standard gas was prepared by diluting the appropriate amount of nitrogen dioxide or nitric oxide gas in nitrogen gas, and the adsorbed amount of NOx was determined gravimetrically using a quartz spring. The adsorption efficiency of NO2 decreased with the increase in temperature, however the slope of the plots for adsorbed NO2 amount versus initial NO2 concentration remained the same regardless of the temperature. The initial NO2 adsorption on activated carbon proceeded nearly in the first-order reaction rate. Although no apparent NO adsorption by activated carbon occurred, it was adsorbed when oxygen was present in the same sample gas. The initial adsorption rate for NO was proportional to the NO concentration raised to the 1.7 power and O2 concentration raised to the 0.8 power. The amount of NO adsorbed by carbon was much smaller than that of NO2. In a system with NO-O2-water in the sample gas, the initial adsorption rate for No was proportional to the NO concentration raised to the 0.4 power, O2 concentration raised to the 0.4 power, and H2O concentration raised to the 0.25 power. Although the adsorbed amount of NO at equilibration increased with increased H2O concentration in the sample, it was not affected by oxygen concentration in the range 2% to 8%.

56372 **APTIC NO. 73457**

Todo, Naoyuki, Minoru Kurita, Hiroyuki Hagiwara, Hironobu Ueno, and Toshio Sato

SULFATE SALT FORMATION WITH SUPPORTING MATERIALS IN CATALYTIC NOX REMOVAL. *(NOx jokyo shokubai no tantai no ryusan enka ni taisuru tanjibutsu no eikyo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 498, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 3K45.)*

The sulfate salt formation with supporting material for metal oxide catalysts used in denitrification processes of gases is studied. The supporting materials used are silica gel, silica alumina, gamma-alumina, and alpha-alumina on which copper oxide, ferric oxide, or vanadium (V) oxide is loaded as the catalyst. A standard gas was prepared with a composition of 500 ppm sulfur dioxide, 200 ppm nitric oxide, 300 ppm ammonia, 3% oxygen, 10% water, and balance nitrogen. It was passed through the catalyst bed and the sulfate salts produced were analyzed by X-ray diffraction. Aluminum sulfate was formed in the system of the ferric oxide on gamma-alumina and the sulfate salt produced in the system of vanadium(V)oxide on gamma-alumina was aluminum ammonium sulfate. No sulfate salt formation was observed by supporting materials without loading a metal oxide catalyst, indicating that the metal oxide was catalyzing the formation of sulfate salts. The effect of aluminum sulfate formation by NO, NH3, and O2 of the passing gas was also determined from the height of the aluminum sulfate peak on the X-ray diffraction spectra. When NO or both NO and ammonia were excluded from the standard gas, the aluminum salt formation decreased, while the formation increased when ammonia or both ammonia and oxygen were excluded. No aluminum salt formation was detected when only oxygen was excluded from the standard gas.

56373 **APTIC NO. 80714**

Uehara, Yoichi and Shosuke Suzuki

THE EFFECT OF CHLORINATED POLYETHYLENE ON THE COMBUSTION OF POLYETHYLENE. *J. Fire Flammability, vol. 6:451-467, Oct. 1975. 16 refs. (Presented at the Butler Meeting, Calif., May 1974.)*

Polyethylene (PE)-chlorinated polyethylene (CIPE)-antimony oxide mixtures were measured and their degradation behaviors were examined by thermal gravimetric and DTA-gas chromatography methods. Chlorine did not significantly affect the decomposition of PE in the condensed phase; it had only a dilution effect. Hydrogen chloride produced from CIPE was expected to contribute, in the gas phase, to at least part of the flame inhibition. Carbonaceous materials formed on the burning surface obscured radiation from the flame and reduced heat conduction, thus producing an additional inhibition effect. (Author abstract modified)

56374 **APTIC NO. 80700**

Venkataramani, K. S., N. K. Tutu, and R. Chevray

PROBABILITY DISTRIBUTIONS IN A ROUND HEATED JET. *Phys. Fluids, 18(11):1413-1420, Nov. 1975. 14 refs.*

Measurements of the marginal and joint probability density functions of the longitudinal and radial components of the velocity, and temperature at three different radial positions of an axisymmetric heated turbulent air jet are presented. The marginal probability density functions of u and v are nearly normal at the centerline and less so at a radial position one diameter away from it, whereas these depart considerably from the normal at the position there the intermittency factor gamma equals 0.6. At the centerline again, the joint densities p(u, v) and p(v, theta) are nearly normal. At this position p(u, theta) is unsymmetrical, and even a non-Gaussian Gram-Charlier distribution using cumulants up to the fourth order is inadequate in approximating it. Joint densities at 1 and 1.89 diameter indicate that the normal distribution, while being reasonably good at the centerline, departs from the measured density more and more as one moves away from the axis.

56375 **APTIC NO. 80517**

Voorhoeve, R. J. H., C. K. N. Patel, L. E. Trimble, and R. J. Kerl

HYDROGEN CYANIDE PRODUCTION DURING REDUCTION OF NITRIC OXIDE OVER PLATINUM CATALYSTS. *Science, 190(4210):149-151, Oct. 10, 1975. 25 refs.*

The catalytic reduction of nitric oxide with carbon monoxide and hydrogen was studied with a bench scale flow reactor at 400-800 C over platinum to determine the yield of hydrogen cyanide. An opto-acoustic infrared absorption technique was applied to the analysis of HCN. In mixtures of NO, CO, H2, and water vapor, with all concentrations in the range of 0.1 to 5%, up to 80 ppm of HCN was formed over Pt at 600-800 C. In the absence of water vapor, the HCN concentration rose to 700 ppm. With 6-60 ppm of sulfur dioxide in the gas mixture, HCN production was suppressed to less than 5 ppm. There were no significant differences between a Pt sponge and Pt supported on cordierite. Because of the toxicity of HCN, the determination of HCN in catalytically treated automotive exhaust is recommended. (Author abstract modified)

56376 **APTIC NO. 80519**

Wassel, A. T., D. K. Edwards, and I. Catton

MOLECULAR GAS RADIATION AND LAMINAR OR TURBULENT HEAT DIFFUSION IN A CYLINDER WITH INTERNAL HEAT GENERATION. *Intern. J. Heat Mass Transfer, 18(11):1267-1276, Nov. 1975. 25 refs.*

Simultaneous nongray radiation and thermal diffusion in a thermally and hydrodynamically established laminar or turbulent pipe flow with uniform internal heat generation was investigated. The governing integro-differential thermal energy equation was solved using the Galerkin technique for the laminar case and finite difference and numerical iteration techniques for turbulent flow. Solutions are presented for radiative and convective Nusselt number as a function of the radiation to molecular conductance ratio N subscript rm, the optical depth tau subscript R along the radius at a photon wavenumber spectrally located at the head of an exponential tailed absorption band, and a turbulent Reynolds number Rt. The radiative Nusselt number increased almost linearly with N subscript rm and linearly with tau subscript R at small tau subscript R but approximately logarithmatically at large tau subscript R. The radiative transfer increased with increasing turbulent Rt, as the turbulence improved the effective wall lager gas transmissivity. (Author abstract modified)

56377 **APTIC NO. 73347**

Yamada, Tamotsu and Kiyoko Suzuki

COMBUSTION OF EXHAUST GAS COMPONENTS BY COPPER OXIDE. *(Haiki gasu seibun no sanka do ni yoru nensho). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 791, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 1045.)*

Oxidation reactions of carbon monoxide and vaporized gasoline components by copper oxide and catalytic reduction of nitric oxide by copper metal are studied by differential thermal analysis (DTA). The oxidation of CO by CuO started at 150 to 180 C and its DTA curve showed a peak at 300 to 305 C while the oxidation of vaporized gasoline components by CuO started at 230 to 250 C and a single peak at 330 to 340 C was observed on its DTA curve. When NO was reduced by copper metal, the NO reduction started at 150 C and peaked at 250 C on the DTA curve. Therefore both CO and hydrocarbons of gasoline could be oxidized by CuO and the reduced copper could be further utilized to reduce NO to nitrogen gas, and these three reactions could be induced at temperatures above 250 C.

56378 **APTIC NO. 73213**

Yasuoka, Takashi and Shunmei Mitsuzawa

ON THE IONIZATION POTENTIAL AND REACTIVITY IN HYDROCARBON AND NITROGEN OXIDE PHOTOCHEMICAL REACTION. *(Tanka suiso nisanka chisso kokagaku hanno ni okeru ionka denatsu to kanno sei ni tsuite). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 789, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 1043.)*

Photochemical reactivities of various hydrocarbons with nitrogen oxide are calculated as the relative reactivity to the reactivity of tetramethylethylene. In the same group of hydrocarbons, the relative reactivity increased with the decrease in ionization potential of the hydrocarbons. The relative reactivity for ethylene, 1-butene, propylene, 3-hexene, and trans 2-butene increased in this order, which is the order of decreasing ionization potential of these hydrocarbons.

56379 **APTIC NO. 73237**

Environmental Agency (Japan)

SURVEY ON PHOTOCHEMICAL REACTIVITY OF HYDROCARBONS. *(Tanka suiso rui no kokagaku hannosei chosa). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 10(1):44-92, Jan. 1975.*

Photochemical reactivities of 22 hydrocarbons were studied using a vinyl fluoride bag and smog chamber. A gas mixture containing 2 ppm (v/v) hydrocarbon and 1 ppm nitric oxide plus nitrogen dioxide was irradiated for about 6 hr at 25-27 deg and about 50% humidity. Hydrocarbons were analyzed by gas chromatography with flame ionization detector. Nitrogen oxides and ozone were analyzed by the chemiluminescence method while peroxyacetyl nitrate was analyzed by process gas chromatography with an electron capturing detector. In the case of the vinyl fluoride bag, the NO increasing rate and NO2 decreasing rate were in the range of 0.94-1.24 ppb/min. Ozone at 0.7 ppm was reduced 17% without irradiation for 5 hr, but was reduced 41% when irradiated for 6 hr. In the smog chamber, the NO decreasing rate was approximately 3 times faster than that in the vinyl fluoride bag, and the formations of PAN and aldehydes were also considerably faster. The effect of hydrocarbon were also considerably faster. The effect of hydrocarbon on NO decreasing rate was in the decreasing order of mesitylene, m-xylene, propylene, toluene, styrene, and trichloroethylene.

1974

56380 **APTIC NO. 73529**

Blackwood, James D. and David J. McCarthy

PRODUCTION OF SULPHUR COMPOUNDS BY REACTION OF CARBON AND SULPHUR DIOXIDE. *Proc. Aust. Inst. Min . Met., no. 249:25-31, March 1974. 7 refs.*

Reactions between sulfur dioxide and variouss carbon compounds involving the conversion of the former to thee less noxious elemental sulfur or more useful carbon disulfide were investigated. Variations in product distribution in the carbon-sulfur dioxide system due to variations in reaction temperature, SO2 concentration in the feed gas, and gas-solid contact time were examined for a brown coal char and were compared with those for two wood chars, a coke prepared from Liddell coal, and two cokes prepared from Acland coal. Conversions of SO2 to either elemental S or CS2 with the brown coal char were in excess of 90% under suitable conditions; the wood chars gave similar product distributions to coal char. The cokes from Acland and Liddell coals were about three and seven times less reactive, respectively, than the brown coal char. Theapproximate carbon holdup required to just achieve total SO2 conversion was a function of reaction temperature. Maximum selectivity for conversion to elemental S occurred when a small proportion of the SO2 remained unconverted. (Author abstract modified)

56381 **APTIC NO. 80880**

Filimonov, D. A. and R. A. Strel nikova

GASEOUS LOSSES OF AMMONIA FOLLOWING SURFACE APPLICATION OF UREA. *Sov. Soil Sci. (English translation from Russian of: Agrokhimiya), no. 6:426-432, July-Aug. 1974. 22 refs.*

Gaseous losses of ammonia following the surface application of urea to two different soil types placed in laboratory dessicators were studied. Ammonia losses varied from 2-20% of the applied amount and depended on the duration of composting, the temperature and moisture content of the soil, and reactions within the soil. An intense release of ammonia was observed on the sixth day following urea application at a temperature of 28 C and a soil moisture content of 10%. This loss practically ceased on the 10th day following application. The greatest ammonia losses occurred at a soil moisture content of 7-10% which amounted to 20-25% of the total moisture capacity of the soil. The losses were small from air-dry soil and decreased from 18% to 2% with an increase in moisture content from 20-75% of the total moisture capacity. The optimum temperature for ammonia loss was 28 C. The losses decreased with temperature and amounted to 4% to 0 C. Soil acidification with sulfuric acid reduced ammonia losses from urea considerably; ammonia loss was 16.5% at a pH of 6.8, 11% at a pH of 6.0, and only 7.6% at a pH of 5.0.

56382 **APTIC NO. 73211**

Ikebe, Y. and E. Nagaoka

EXPERIMENT OF ION ADSORPTION TO CHARGED WATER MIST. *(Taiden bisuiteki eno ion fuchaku jikken. (II)). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 12:13-20, 1974. 4 refs.*

The interaction between ion and aerosol, the ionization equilibrium, was studied by measuring the adsoprtion coefficient and ion flux. The effects of Coulomb force and diffusion force on the adsorption of ions onto charged stationary and falling particulates were compared. The stationary ion adsorption solely by Coulomb force, solely by diffusion force, and by combination of Coulomb force and diffusion force were analyzed based on Israel s equation, Smoluchowski s equation, and Gunns theory, respectively. Within the range of conditions of this experiment, the effect of diffusion force on the adsorption of ions to charged particulates was negligible.

56383 **APTIC NO. 73635**

Kuhnes, U.

ELECTRON SPIN RESONANCE FLOW REACTOR FOR THE DETERMINATION OF THE KINETIC PARAMETERS OF ATMOSPHERIC GASEOUS-PHASE REACTIONS. *(Ein Elektronspinresonanz-Stroemungsreaktor zur Bestimmung von kinetischen Parametern atmosphaerischer Gasphasenreaktionen). Text in German. In: Chemische Reaktionen atmosphaerischer Schadstoffe. Kernforschungszentrum Karlsruhe, Karlsruhe (West Germany), Institut fuer Radiochemie, p. 65-76, May 1974. 8 refs.*

A method for the determination of the kinetic parameters of quantitative atom-molecule reactions in the gaseous phase by means of an electron spin resonance flow reactor is described. The reagents, flowing through the flow reactor at constant speed and mixed inside the reactor in an inert carrier gas, and the concentration changes of the atoms and radicals along the reactor tube are determined by an electron spin resonance spectrometer. The pressure inside the flow reactor is set between 0.1 and 10 torr, and the flow velocity is selected between 20 and 50 m/sec. The sensitivity of the detection lies between 20,000,000,000 and 40,000,000,000 spins/cu cm. The stable end products formed in the radical reactions are identified by means of a mass spectrometer.

56384 **APTIC NO. 80394**

Libby, L. M., J. Enstrom, G. P. Fisher, D. Holliday, and M. Hura

EVALUATION OF CATALYTIC NEEDS OF THE DOD (FINAL TECHNICAL REPORT). *R and D Assoc., Santa Monica, Calif., Defense Advanced Research Projects Agency Contract DAHC15-73-C-0312, Rept. RDA-TR-3501-003, 206p., Feb. 1974. 158 refs.*

NTIS, DDC: AD/A-001 245

The prognosis for fulfillment of the energy needs of the Department of Defense (DOD) up to 1990 is that the DOD will be in competition with the civilian economy for energy supplies and that it may contribute significantly to air pollution unless it begins immediately to support a research and development effort directed toward production of its own energy and catalyst needs. The state of the art of catalysis is assessed, including a survey of the theory of catalysis, basic research in the theory of heterogeneous catalysis, DOD dependence on catalysts for its fuel needs, and the state of experimental research in catalysis. Air pollution contributed by two Air Force bases in the Los Angeles area is assessed. These bases are minor polluters of sulfur oxides at present, but only because they have been able to use low sulfur fuel oil for heating. Norton Air Force Base was a significant polluter in terms of the State of California Air Pollution Control Board s standards before the conversion. The nitrogen oxides concentration down wind of the bases is about 0.08 ppm, if averaged around the clock and throughout the year. The down-wind NOx levels may exceed the California Air Resources Board Standard of 0.25 ppm maximum for a maximum of 1 hr during peak base activity. (Author abstract modified)

56385 **APTIC NO. 79854**

Lunsford, Jack H.

EPR AND IR STUDIES ON SURFACE NITROSYL COMPLEXES. *Preprint, Genera Motors Corp., Detroit, Mich., 20p., 1974. 13 refs. (Presented at the Catalytic Chemistry of Nitrogen Oxides Symposium, Detroit, Mich., Oct. 7-8, 1974.)*

Studies of surface complex formation between nitric oxide and metal ions are reviewed. The nature of the metal ion and the type of other ligands significantly affect the bonding and the reactivity of nitric oxide. Data on the effects of electron-donating ligands suggest that maximum reactivity is achieved by making the nitrosyl ligand anionic. If the dissociation of nitric oxide is important, a metal ion which allows oxygen to desorb from the complex is preferably used. Cobalt(II) amine complexes in zeolites appear to make these requirements. (Author summary modified)

56386 **APTIC NO. 80861**

Matsui, Hiroshi, Yoshikazu Yoshida, Mikio Murata, and Tsutomu Ohata

MEASUREMENT OF DEPOSITION FRACTION OF AEROSOL PARTICLES IN A HORIZONTAL STRAIGHT METAL PIPE. *J. Nucl. Sci. Technol., 11(7):300-307, July 1974. 12 refs.*

The estimation of the fraction of aerosol particles deposited on a horizontal straight metal pipe was examined using a method based on an equation to express deposition velocity and an extrapolation method. The deposition fraction estimated with the deposition equation based on gravity settling gave values larger than experimentally determined ones by a factor of two for laminar flow. Deposition was governed mainly by gravity settling for turbulent flow if the Reynolds number was less than or equal to about 10,000 for particle sizes below a few micron. Thus, the deposition fraction was roughly estimated equally well using either the deposition equation or the extrapolation method. For the case of relatively slow turbulent flow where the deposition was mainly governed by gravity settling, the average deposition velocity of aerosol particles barely changed with flow velocity or Reynolds number. The use of a suitable friction factor to account for the roughness of the pipe wall gave a reasonable value for the deposition fraction in the turbulent region. (Author summary modified)

56387 **APTIC NO. 80867**

Nekrich, Y. M., N. N. Kuvaldina, and N. I. Pevnyi

ACTIVITY OF BINARY OXIDE CATALYSTS IN REDUCTION OF NITROGEN OXIDES BY CARBON MONOXIDE AND HYDROGEN. *(Aktivnost binarnykh okisnykh katalizatorov pri vosstanovlenii okislov azota okis yu ugleroda i vodorodom). Sov. Chem. Ind. (English translation from Russian of: Khim, Prom.), 6(8):505-506, 1974. 10 refs.*

The activity of binary oxide catalysts was studied in relation to the reduction of nitrogen oxides by carbon monoxide and hydrogen. Binary supported catalysts containing less than 10% ferric oxide and up to 5% chromic oxide proved to be more active than catalysts composed of individual oxides. The extent of reduction of nitrogen oxides was about 100% for temperatures above 250 C. The addition of an alkali to an iron oxide catalyst (7.9% ferric oxide impregnated with a 10% solution of potassium nitrate) resulted in a lowering of the reduction temperature.

56388 **APTIC NO. 73588**

Nicolet, Marcel

ON THE PRODUCTION OF NITRIC OXIDE BY COSMIC RAYS IN THE MESOSPHERE AND STRATOSPHERE. *Pennsylvania State Univ., University Park, Ionosphere*

Research Lab., National Science Foundation Contract GA-33446X1, Rept. PSU-IRL-SCI-429, 42p., Sept. 3, 1974. 37 refs.

NTIS: N74-34792

The production of nitric oxide by cosmic rays in the mesosphere and stratosphere is theoretically examined. Since nitrogen oxides formed in the thermosphere by reactions involving charged species cannot penetrate down into the stratosphere, the normal presence of NOx in the stratosphere must be due to their formation in that region. Aside from the formation of NO via the reaction of nitrous oxide and atomic oxygen, NO is also formed in the atmosphere through the dissociation of molecular nitrogen by galactic cosmic rays. One NO molecule is formed for each ion pair produced by cosmic ray ionization. The height-integrated input (day and night) to the lower stratosphere is of the order of 60 million NO molecules/sq cm/sec in the auroral zone (geomagnetic latitude of equal to or greater than 60 deg) during the minimum of the sunspot cycle and 40 million NO molecules/sq cm/sec in the subauroral belt and auroral region (geomagnetic latitude of equal to or greater than 45 deg) at the maximum of solar activity. The tropical production is less than 10 million NO molecules/sq cm/sec above 17 km, and at the equator the production is only 3 million NO molecules/sq cm/sec. (Author abstract modified)

56389 **APTIC NO. 80860**

Novakov, T. and S. G. Chang

CATALYTIC OXIDATION OF SO2 ON CARBON PARTICLES. *Preprint, California Univ., Berkeley, Lawrence Berkeley Lab., 20p., April 1974. 13 refs. (Presented at the National American Institute of Chemical Engineers Meeting, 76th, Session on Applications of Surface Science and Technology in Air Pollution Control, Tulsa, Okla., March 1974.)*

NTIS: LBL-2693

X-ray photoelectron spectroscopic measurements were used to assess the role of finely divided high surface area soot particles in the oxidation of sulfur dioxide to sulfate. Soot catalyzed oxidation was a major form of SO2 oxidation even in the presence of flames and combustion produced gases. Oxidation on soot particles showed a saturation effect, i.e., after the saturation of the active sites was achieved, excess SO2 was not further oxidized. The availability of reactive carbon particles in combustion processes suggests that sulfate-bearing particles are emitted into the atmosphere as primary pollutants from sources if the fuels used contain trace amounts of sulfur. Catalytic sulfate formation is also expected to occur in the atmosphere on reactive carbon particles. A chemisorptive mechanism may play a dominant role in urban situations that are characterized by large particulate carbon concentrations. (Author conclusions modified)

56390 **APTIC NO. 80789**

Pate, C. T., B. J. Finlayson, and J. N. Pitts, Jr.

A LONG PATH INFRARED SPECTROSCOPIC STUDY OF THE REACTION OF METHYLPEROXY FREE RADICALS WITH NITRIC OXIDE. *J. Am. Chem. Soc., 95(21):6554-6558, Oct. 16, 1974. 30 refs.*

The reaction of nitric oxide with CH3O2 radicals generated in the photooxidation of azomethane at wavelengths greater than 320 nm was investigated at 23 + or - 2 deg using long path infrared and gas chromatographic techniques. Reaction conditions were: azomethane, 33 to 369 mtorr; oxygen, 2200 to 5320 mtorr; and NO, 25 to 76 mtorr, with helium or nitrogen added to produce a total pressure of 760 torr. At short photolysis times, methyl nitrite and nitrogen dioxide were both identified as products with quantum yields of 1.7 + or - 0.2 and 1.9 + or - 0.3, respectively. Formaldehyde was qualitatively identified in several runs by the chromotropic acid test. Methyl nitrate also accumulated at longer reaction times. These results suggest that the reaction by which CH3O2 + NO form CH3O + NO2 is the only path for the reaction of methylperoxy radicals with nitric oxide under these conditions. The CH30 is then removed by the reactions by which CH3O + NO2 form methyl nitrate, CH3O + NO2 form HCHO + nitrous acid, CH3O + NO form CH3ONO, and CH3O + NO form HCHO + HNO. (Author abstract)

56391 **APTIC NO. 80791**

Portrait, L. M., S. Gauffier, and C. Meyer

NITRIC OXIDE FORMATION IN NATURAL GAS DIFFUSION FLAME. *(La formation de l oxyde azotique dans les flammes de diffusion de gas naturel). Text in French. Rev. Inst. Franc. Petrole, 29(4):553-570, July-Aug. 1974. 6 refs.*

Investigations have revealed a general correlation between the maximum amount of nitrogen oxide formed and the maximum temperature of a natural gas diffusion flame. Other variables were investigated including type of flame, air excess, air preheating, oxygen content in the oxidant, heating power, and kinetic moment output. Some of the findings were tested in an effort to find an equation for the rate of NO formation that could be applied to axial flames from natural gas diffusion. Calculations are based on findings obtained from the kinetic analysis of NO formation. The results of theoretical computations confirm those of research with an experimental furnace with regard to the preponderant influence of temperature on the formation of nitrogen oxide. Theoretical computing and fundamental research results agree that the NO formation kinetics move the length of the flame from the flame front to the burned gases. To generalize the experimental kinetic equation obtained to a large number of flames, various previously neglected diffusion phenomena must therefore be taken into consideration. (Author abstract)

56392 **APTIC NO. 73226**

Sawaya, Tsuguo and Akira Banno

STUDIES ON ANALYTICAL CHEMISTRY OF LOW CONCENTRATION NITROGEN OXIDES, PART II. GENERATION OF LOW CONCENTRATIONS OF NO. *(Teinodo chisso sankabutsu no bunseki kagakuteki kenkyu, Dai-2-ho. Teinodo issanka chisso no hassei ni tsuite). Text in Japanese. Asahi Garasu Kogyo Gijutsu Shoreikai Kenkyu Hokoku (Res. Rep. Asahi Glass Found. Contr. Ind. Technol., vol. 24:1-8, 1974. 7 refs.*

Procedures are described for generation of pure nitric oxide gas in concentrations of a few ppm. By adjusting pH, a simple, stable source of large quantities of NO of described concentrations is available. At 20 C, nitrogen gas is passed through 0.1 M sodium nitrite solution, adjusted with phosphate buffer to pH 7. Nitrogen oxides, which are generated, are reduced to NO by passage through a reduction tube containing sponge tin particles (2-3 mm size) and soaking in 2 N sulfuric acid. About 1 ppm NO is obtained. More than ten cu m of NO can be continuously generated. Percentage yield of NO was 80%. The reducing tube was still effective a month after it was made up. A slight amount of reduction to NH3 (0.2 ppm) occurred, probably due to thee presence of zinc impurities in the tin.

56393 **APTIC NO. 73631**

Shkol nikova, R. I. and N. S. Sverdlova

COHESION OF SEVERAL INDUSTRIAL DUSTS IN RELATION TO THE PROBLEMS OF DUST ELIMINATION. *(Issledovanie autogezii nekotorykh promyshlennykh pyley v svyazi s problemami pyleulavlivaniya). Text in Russian. Bor ba Silikozom, no. 9:80-83, 1974. 5 refs.*

The cohesion of granite dust and of a mine dust were studied with respect to the influence of cohesion on dust elimination in mines. The cohesion of the granite particles was highest in a fraction of 0-5 micron, and decreased markedly with decreasing fineness. The cohesion of the mine dust was relatively high in the 0-5 micron fraction, considerably lower between 5 and

50 micron, and high again in the 50-100 micron fraction. The chemical analysis of the latter fraction revealed an enrichment of nickel, copper, iron, and sulfur relative to the other fractions, and the highest specific gravity. The air velocity for ventilation in mines should be higher than the oscillatory speed of the suspended particles, but lower than the speed at which settled particles are entrained by the flow. The cohesion of dusts can be increased by water spray, or by coating the target surfaces with hygroscopic material, such as calcium chloride.

56394 **APTIC NO. 73509**

Sollberger, Frederic and Fritz Stoeckli

THE GAS-SOLID INTERFACE. THE ADSORPTION OF NITROGEN, ARGON, NEOPENTANE, SULFUR DIOXIDE, CARBON DIOXIDE AND SULFUR HEXAFLUORIDE ON RHOMBIC SULFUR. *Helv. Chim. Acta, 57(8):2327- 2331, Dec. 18, 1974. 7 refs.*

The physical adsorption of nitrogen, argon, neopentane, sulfur dioxide, carbon dioxide, and sulfur hexafluoride on rhombic sulfur of 0.4-0.5 sq m/g was studied. Type II isotherms were obtained for nitrogen, argon, and pentane, while type III were obtained for sulfur dioxide and carbon dioxide. Sulfur hexafluoride displayed a linear isotherm. The results for sulfur dioxide and carbon dioxide were surprising and reminiscent of water adsorption on graphite. No hysteresis was observed during the experiments. The surface roughness of the rhombic sulfur was relatively heterogeneous as determined by the method of Ross and Olivier. Entropy calculations for the adsorbed state indicated that mobility on the surface increased in the order of neopentane, sulfur dioxide, nitrogen, and argon. (Author abstract modified)

56395 **APTIC NO. 73537**

Spicer, C. W.

AN EXPERIMENTAL PROTOCOL FOR REACTIVITY MEASUREMENT. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., Proc. Solvent React. Conf., Research Triangle Park, N. C., 1974, p. 29-30, EPA-650/3-74-010: (Nov.)*

NTIS: PB 238 296/AS

The employment of a known set of predetermined experimental conditions in future studies of the photochemical smog reactivity of various hydrocarbon-containing solvents is recommended. A method whereby a large existing smog chamber is divided into four or five smaller chambers by using Teflon compartments is recommended for increasing the efficiency of smog studies.

56396 **APTIC NO. 80820**

Squires, R. G.

CATALYTIC PROPERTIES OF SURFACE SITES ON METAL OXIDES AND THEIR CHARACTERIZATION BY X-RAY PHOTOELECTRON SPECTROSCOPY (SEMIANNUAL TECHNICAL REPORT). *Purdue Research Foundation, Advanced Research Projects Agency Grant DAHC15-73-G11, Order No. 2338, Program Code 4D10, 56p., 1974. 61 refs.*

NTIS, DDC: AD A004916

The oxidation of carbon monoxide and the reduction of nitrogen oxides over chromia catalysts supported on silica were studied. The carbon monoxide/nitric oxide reaction rate was much greater than the corresponding CO/oxygen reaction rate for nearly all catalysts studied. During the oxidation of CO in the presence of O2 and NO, NO did not participate in the reaction until nearly all of the O2 was depleted. The oxidation state was about the same as when O2 was the only oxidizing gas. Different methods of catalyst impregnation significantly altered both the dispersion of the chromium oxide on silica and the stabilized surface oxidation states following reaction. The oxidation state results correlated well with X-ray photoelectron spectra. A definite correlation was observed between the stabilized surface valency and the relative reaction rate. A lower valency favored a higher rate of conversion of CO by either O2 or NO. (Author summary modified)

56397 **APTIC NO. 73289**

Terada, Kiyoshi, Mitsuru Wakamatsu, and Satoshi Shimizu

STUDIES ON GENERATION OF HIGH TEMPERATURES IN ULTRA-HIGH TEMPERATURE TUNNEL KILNS, AND ON FORMATION OF NITROGEN OXIDES WHICH ACCOMPANY GENERATION OF HIGH TEMPERATURE FLAMES. PART 2: STUDIES ON TEMPERATURE AND GAS CONCENTRATION DISTRIBUTIONS WITHIN HIGH-TEMPERATURE COMBUSTION CHAMBERS. *(Chokoon tonneru-gamma no koon hassei hoho narabi ni koonen no hassei ni tomonau chisso sankabutsu no seisei ni kansuru kenkyu. Dai-2-ho: Koon no nenshoshitsunai no ondo bunpu narabi ni gasu nodo bunpu ni kansuru kenkyu). Text in Japanese. Ashi Garasu Kogyo Gijustu Shoreikai Kenkyu Hokoku (Res. Rep., Asahi Glass Found. Contrib. Ind. Technol.), vol. 24:285-299, 1974. 7 refs.*

Studies on internal temperature distributions and gas formation were conducted with combustion chambers of three different shapes. Kilns were constructed of firebrick, with length of the chamber 1000 mm and cross-section 200 by 200 mm. By varying the temperature of preheated air, relationships between temperature distribution of diffusion flames and mixing of the kiln gases were deduced. The rate of combustion of fuel gas is mainly dependent on its mixing rate with air. Changes (presence or absence of sudden contraction) in internal cross-sectional area of the combustion chamber greatly affect maximum flame temperature and temperature distribution. Regions of highest temperatures in the combustion chamber correspond to places where air factors are more or less greatest. There was no correspondence with maximum carbon dioxide values. When kiln temperatures are above 1800 C, the concentration gradient (along the kiln axis) of nitrogen oxides increases slowly in comparison to the temperature gradient. After 0.2-0.3 second, the concentrations more or less reach the calculated values for the equilibrium state at that time.

56398 **APTIC NO. 7330**

Terada, Kiyoshi, Satoshi Shimizu, and Mitsuru Wakamatsu

STUDIES ON GENERATION OF HIGH TEMPERATURES IN ULTRA-HIGH TEMPERATURE TUNNEL KILNS, AND ON FORMATION OF NITROGEN OXIDES WHICH ACCOMPANY GENERATION OF HIGH TEMPERATURE FLAMES. PART 1: THE CALCULATION OF ADIABATIC FLAME TEMPERATURE AND EQUILIBRIUM COMPOSITION OF THE COMBUSTION GASES. *(Chokoon tonneru-gama no koon hassei hoho, narabi ni koonen no hassei ni tomonau chisso sankabutsu no seisei ni kansuru kenkyu. Dai-ichi-ho: Dannetsuen ondo oyobi heiko nensho gasu sosei no keisan). Text in Japanese. Asahi Garasu Kogyo Gijutsu Shoreikai Kenkyu Hokoku (Res. Rep., Asahi Glass Found. Contrib. Ind. Technol., vol. 24:269-283, 1974. 7 refs.*

City gas was burned under various conditions in order to study the behavior of nitrogen oxides formed in high temperature kilns. Computer calculations were made for the fuel system of carbon- hydrogen-oxygen-nitrogen, under conditions of equilibrium gas formation and adiabatic flame temperatures, where thermal dissociation was taken into account. Under actual conditions, the residence time of gas in the furnace is short, so studies must be made from the standpoint of rate theory as well as equilibrium theory. However, for this investigation with city gas, maximum adiabatic flame temperature was somewhat higher (on the side of excess fuel) than its stoichiometric value, and increased with increase in preheated air temperature. Equilibrium concentrations of nitrogen oxides are influenced greatly by flame temperatures and oxygen concentrations, and maximum values corresponded to the presence of excess air.

56399 **APTIC NO. 73288**

Wendling, P.

A COMPARISON OF MEASURED AND CALCULATED ATMOSPHERIC TRANSMISSION SPECTRA IN THE SPECTRAL REGION NEAR 3.9 MICRON. *(Ein Vergleich gemessener und berechneter Transmissionspektren der Atmosphaere im Spektralbereich bei 3.9 mikrometer). Text in German. Beitr. Physik Atmosphaere, 47(4):269-302, 1974. 49 refs.*

An infrared grating spectrometer that was suitable for high resolution measurement of atmospheric transmittance at Maisach near Munich using the sun as source is described. The continuum extinction coefficient in the infrared near 3.82 micron observed during days with different water vapor and aerosol content is separated by applying regression analysis into the following parts: the self-broadened and foreign-broadened component of the water vapor continuum, the portion of absorption due to carbon dioxide and nitrogen, and the contribution of aerosol extinction. In order to get precise information on the line data used for the spectral lines of nitrous oxide also, high resolution laboratory measurements were made. The separation method as well as the comparison of calculated and measured spectra are mainly based on these laboratory data, data from radiosonde ascents, and visual range estimations made by nearby airports. The agreement between calculated and measured spectra is quite good with a height constant N2O-volume mixing ratio of 0.30 + or - 0.03 times 10 to the -6th power. Calculations based on a vertical N2O-distribution with a volume mixing ratio of 0.40 times 10 to the -6th power below a height of 4.5 km and a reduced mixing ratio of 0.23 times 10 to the -6th power above that height-the total amount of N2O remaining constant-yield deviations smaller than the experimental accuracy of + or - 1%. From a part of the compared measured and calculated spectrum approximate line intensities of deuterated water are derived for the total spectral region covered by the measurements.

56400 **APTIC NO. 80390**

Williams, M. M. R.

ON THE VELOCITY DISTRIBUTION OF COAGULATING PARTICLES. *Univ. of London, England, Nuclear Engineering Dept., Rarefied Gas Dynamics Proc. Intern. Symp., 9th, Goettingen, West Germany, 1974, 10p. 4 refs.*

A balance equation for the velocity distribution function of a coagulating aerosol is formulated. The energy loss in the coagulation process is investigated, and two coupled integro-differential equations are obtained for the particle number density and average energy per particle by appropriate averaging and the use of a rational approximation for the velocity distribution. The results indicate that variation in the velocity distribution of the coagulating particles must be accounted for in order to explain the time behavior of the total particle density and average mass per particle.

1973

56401 **APTIC NO. 80612**

Braier, H. A.

ANALYSIS OF FUEL OILS FOR TRACE METALS. *In: Manual on Requirements, Handling, and Quality Control of Gas Turbine Fuel, ASTM STP 531. Philadelphia, Pa., American Society for Testing and Materials, 1973, p. 167-190. 16 refs.*

Analytical techniques for the determination of trace quantities of vanadium, lead, sodium, potassium, calcium, and magnesium in fuel oils for gas turbines are reviewed. Neutron activation analysis is capable of high sensitivity and requires little or no sample preparation. Interferences can be eliminated by instrumental or chemical means or by the application of proper corrections. X-ray fluorescence analysis can be performed using rapid and simple techniques with little sample preparation for concentrations above 0.01%. It is an excellent method when applied to routine samples. Atomic emission flame photometry is inexpensive and simple and offers a very high sensitivity for certain elements. Atomic absorption spectrometry offers good sensitivity for most metallic elements and is susceptible to few interferences. Spark source mass spectrometry is the only method that offers high and uniform sensitivity for all elements with the exception of hydrogen and helium. Each technique is reviewed in terms of its principles of operation, advantages and disadvantages, and cost and space requirements.

56402 **APTIC NO. 80878**

Knipovich, O. M., Y. M. Emel yanov, and Y. V. Filippov

ELECTRO-SYNTHESIS OF OZONE FROM THE AIR. II. SYNTHESIS OF NITROGEN OXIDES IN THE OZONISER. *Russ. J. Phys. Chem. (English translation from Russian of: Zh. Fiz. Khim.), 47(10):1474-1475, 1973. 25 refs.*

The kinetics of the synthesis of nitrogen oxides in an ozonizer at three fixed discharge powers and various air flow rates was studied. The concentration of nitrogen pentoxide increased linearly with the specific energy of the discharge when ozone was present. In the absence of ozone, nitrogen pentoxide decomposed into lower oxides of nitrogen. When the ozone disappeared before a steady concentration of nitrogen oxides was reached, the kinetic curve showed a simple saturation effect. Calculated rate constants for the formation and decomposition of nitrogen oxides are presented along with proposed mechanisms of the reactions involved.

56403 **APTIC NO. 80879**

Knipovich, O. M., Y. M. Emel yanov, and Y. V. Filippov

ELECTRO-SYNTHESIS OF OZONE FROM THE AIR. I. KINETICS OF THE PROCESS. *Russian J. Phys. Chem. (English translation from Russian of: Zh. Fiz. Khim.), 47(10):1472-1473, 1973. 29 refs.*

The kinetics of the electro-synthesis of ozone from air were studied in an ozonizer, and the results were compared with kinetic data obtained for the synthesis of ozone from oxygen. The kinetic curves obtained by keeping the air flow rate constant and varying the power of the discharge displayed a maximum, after which the concentration of ozone fell to zero. The higher the flow rate of air (and the power of the discharge), the lower was the ozone concentration at the maximum. These kinetic curves were similar to those obtained for the synthesis of ozone from oxygen, with the ozone concentration falling with an increase in the power of the discharge and the temperature in the reaction zone. However, the synthesis of ozone from oxygen, the ozone concentration decreased more gradually and did not fall to zero. The steep decrease in ozone concentration during the ozonizer experiment was possibly the result of inhibition by nitrogen oxides.

56404 **APTIC NO. 80869**

Onischak, Michael and Dimitri Gidaspow

KINETICS OF REGENERATIVE SORPTION OF NITRIC OXIDE BY SOLID FESO4 FOR ENVIRONMENTAL CONTROL. *AIChE Symp., Ser., 69(134):54-70, 1973. 51 refs.*

The kinetics of sorption of nitric oxide on a silica gel sorbent containing a ferrous salt were studied as a function of NO concentration in the range of 50 to 1000 ppm. The sorbent was regenerated thermally after each run. Sorption temperatures varied from 70 to 200 F. A thin layer of the sorbent, 3 inch wide by 15.6 inch long, formed part of a wall of a hydrodynamically well defined parallel plate channel. A correction for diffusion could be obtained yielding flow independent kinetic data by varying flow rates and using an integral equation analysis. The room temperature sorption data were correlated by a simple equation. The equation included the mole percentage of NO in the gas, sorpiton time, an effectiveness factor, and the rate constant in the primary sorption reaction. Another factor appears due to a competitive reaction which appears to involve an extra degradation of the sorbent due to sorption of water from the gaseous stream. (Author abstract modified)

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56405 **APTIC NO. 80710**

Beeckmans, J. M.

ANALYSIS OF AEROSOL DECAY DURING BREATH-HOLDING. *Ann. Occupational Hyg., vol. 18:161-172, Sept. 1975. 13 refs.*

The decay in aerosol concentration in the human respiratory tract during breath-holding in single breath inhalation was studied analytically. The calculations incorporate ideas on air flow and on aerosol deposition within the respiratory tract, proposed by Davies. Models were developed for both the diffusion controlled transport case and for the sedimentation controlled transport case. Agreement between the calculations and the experimental data of Palmes is acceptable when Weibel's model of the respiratory tract is used to define airway dimensions, but Davies respiratory tract model results in calculated decay rates which are considerably lower than the experimental rates. (Author abstract modified)

56406 **APTIC NO. 80733**

Bientz, M. and J. P. Donne

PULMONARY PATHOLOGY AND AIR POLLUTION BY ASBESTOS DUST. *(Pathologie pulmonaire et empoussierage par l amiante). Text in French. Gaz. Med. (Paris) France, 82(17):2045-2048, 2052-2054, 2060, 1975. 25 refs.*

The manifestations of pulmonary asbestosis due to asbestos dust appear after 10-40 years. In chronological order, the following diseases develop: pleurisy, calcification and pleural plaques, diffuse interstitial fibrosis, and sometimes, cancer of the pleura, the lung, or the peritoneum of certain abdominal organs. Pulmonary fibrosis, which appears after proloned exposure, is marked by dyspnea. The carcinogenic power of asbestos dust depends on its mineralogical nature, the concentration of dust in the tissues, the physical character of the fibers and the absorption of various impurities. Diagnosis of asbestosis is based on the history of occupational risk, radiological findings and examination of sputum and biopsies.

56407 **APTIC NO. 80538**

Blumer, W. and T. Reich

HEALTH INJURIES BY LEADED GASOLINE. *(Gesundheitsschaedigung durch Bleibenzin). Text in German. Schweiz. Rundsch. Med., 64(12):261-265, 1975. 44 refs.*

The urine of 50 patients suffering from early signs of lead intoxication (headache, fatigue, troubles of the digestive system, nervousness, and lack of sleep) was examined for the occurrence of deltaaminolevulinic acid. In one third of all cases this substance was above the limit of 4 mg/l of urine. After treatment with calcium edetate, sodium citrate, and vitamins for the elimination and neutralizatin of Pb, the volume of deltaaminolevulinic acid receded to lower levels and the symptoms disappeared.

56408 **APTIC NO. 80557**

Bohning, D. E., R. E. Albert, M. Lippmann, and V. R. Cohen

EFFECTS OF FLUOROCARBONS 11 AND 12 ON TRACHEOBRONCHIAL PARTICLE DEPOSITION AND CLEARANCE IN DONKEYS. *Am. Ind. Hyg. Assoc. J., 36(12):902-908, Dec. 1975. 16 refs.*

Donkeys, as a test analogue for humans, were exposed to 1000 ppm concentrations of two different fluorinated hydrocarbon compounds, trichlorofluoromethane and dichlorodifluoromethane, separately and mixed in equal parts. These levels are chosen because they are currently used as occupational exposure standards. Alterations in tracheobronchial particle deposition or clearance attributable to the fluorocarbon exposures were sought. The movement of the mucus blanket propelled by mucociliary action was monitored by external gamma counting of a radioisotope tagged aerosol deposited on its surface by inhalation. Exposure to fluorocarbons 11 and 12 for up to 6 hr did not significantly alter regional particle deposition or mucociliary clearance rates in donkeys. A comparison of retention levels and clearance rates at the beginning of the study with those at the end showed no cumulative residual effects from the 13 mo of intermittent fluorocarbon exposure (a total of approximately 114 hr for each animal). (Author abstract modified)

56409 **APTIC NO. 79914**

Bonashevskaya, T. I.

THE BARRIER FUNCTION OF THE MUCOUS MEMBRANE OF THE NOSE IN THE ACTION OF ATMOSPHERIC POLLUTIONS. *Text in Russian. Gigiena i Sanit., no. 9:14-17, 1975. 10 refs.*

The barrier function of the mucous membrane of the nose is discussed. In the structure of the epithelial layer of the olfactory and respiratory parts of the mucous membrane of the nose, there is a system of basal cells that are highly sensitive to the action of chemical substances entering the body by the respiratory route.

56410 **APTIC NO. 80914**

Cole, Jerome F.

THE LEAD POLLUTION OF CHILDREN BY METALLURGICAL EMISSIONS. *(Die Bleibelastung von Kindern durch Huettenemissionen). Text in German. Metall (Berlin), 29(9):949-951, 1975.*

The biochemical and psychoneurological parameters of lead exposure of 138 children aged 18 yr living in the Smeltertown section of El Paso, Texas in the vicinity of a large lead refinery, and in two control groups, one living in the city of El Paso, and another in a rural area about 12 mi from the refinery, are presented. The socioeconomic and racial distribution was largely the same in all 3 groups. The children in the exposed group have been living in the Smeltertown section for 7 yr, and their parents for 22-23 yr. Significant differences were found in the biochemical parameters: the average blood lead concentration was 50 micrograms/100 ml in the Smeltertown group, 20 micrograms/100 ml in the urban group, and 16 micrograms/100 ml in the rural group. The average protoporphyrin level was 186 micrograms/100 ml in the Smeltertown group, 80 micrograms/ 100 ml in the urban group, and 67 micrograms/100 ml in the rural group. Forty-four of the 138 Smeltertown children were highly exposed (4 out of the 5 biological tests were positive), and 3 out of 5 tests were positive in 75 children in this group. Less than 3 parameters were positive in 19 children. Body weight, height, and nutrition were normal in the exposed group, and while the hemoglobin levels were slightly lower than in the two control groups, no lead-related anemia was found. No relationship was found between high blood lead level and hyperactivity. The psychometric and neurological tests (Wechsler Intelligence Test for Children, Wechsler Adult Intelligence Scale, McCarthy Scales, Peabody I. test, Wide Range Achievement Test, Bender-Koppitz Visual-Motor Test, Wepman Auditory Test, Draw-a-Person Test, Oseretsky Test of Motor Development, Barry Test of Visual-Motor Integration, and California Test of Personality) revealed no significant lead-relevant differences between the three groups. The findings indicate a sufficiently wide safety margin between the acceptable normal lead exposure and the degree of exposure which causes lesions and changes beyond the physiological limits even latent ones.

56411 **APTIC NO. 80825**

Collyer, Harry J.

CARBON BLACK AND ECOLOGY. *In: Conference Proceedings on Environmental Aspects of Chemical Use in Rubber Processing Operations, Akron, Ohio, Environmental Protection Agency, Washington, D. C., Office of Toxic Substances, Rept. EPA-560/1-75-002, p. 130-136, March 12-14, 1975.*

The chemical nature and environmental impact of carbon black are reviewed. Carbon black by the Occupational Safety and Health Administration definition is not a hazardous material and is not toxic. The threshold limit value relates to good housekeeping. Heavy metals, cyanides, phenols, and polychlorinated biphenyls are either absent or present only in trace amounts. Carbon black does not qualify under the OSHA standard for carcinogens. Morbidity and mortality studies of carbon black workers indicate no specific health problems associated with exposure to the material. (Author abstract modified)

56412 **APTIC NO. 79855**

Davis, Mackenzie L.

POTENTIAL FOR INFECTION FROM WASTEWATER SPRAY AEROSOLS. *Preprint, 17p., 1975. 33 refs. (Presented at the Complete Watereuse: Water's Interface with Energy, Air, Solids, National Conference, 2nd Chicago, Ill., May 4-8, 1975.)*

The potential for human infection from wastewater spray aerosols generated during the land application of municipal sewage is discussed. Infection by the inhalation route is concluded to be comparable to the potential for infection in normal confined public environments. However, transfer from objects contaminated due to droplet fallout may be a more likely mode of pathogen transmission. Moreover, although vegetative bacteria and viruses appear to yield low probabilities of receptor contamination, no such assumption can be made about pathogenic spores. A theoretical analysis of the probability of infection via the inhalation route for a single nigh time exposure is presented.

56413 **APTIC NO. 73235**

Doniash, I., K. V. Swettenham, and M. K. S. Hathorn

PREVALENCE OF ASBESTOS BODIES IN A NECROPSY SERIES IN EAST LONDON: ASSOCIATION WITH DISEASE, OCCUPATION, AND DOMICILIARY ADDRESS. *Brit. J. Ind. Med. (London), 32(1):16-30, 1975. 18 refs.*

The prevalence of asbestos bodies was measured in lung sections in a necropsy series at the London Hospital (1965-1966) after exclusion of all known asbestos factory workers and cases of asbestosis and of mesothelioma. Asbestos bodies were present in 42% of the 216 men and 30% of the 178 women. There were less than 6 asbestos bodies per 6.75 cu nm lung tissue in 107 of the total 145 positive cases in contrast to 1000 or more in asbestosis. There was an increased number of asbestos body positives in males with carcinoma of the stomach and females with carcinoma of the breast. There was an excess of asbestos body positives in heavy manual workers (60%) and in both heavy and light manual male workers in the shipping (61%), electrical and engineering (56%), and transport industries (54%). The incidence of asbestos body positives according to home address was highest (53% in males, 45% in females) in patients living in the industrial and dockland area due east of the hospital. There was a positive association with carcinoma of the stomach and breast, possibly playing a direct pathogenic role in carcinoma of stomach. No positive association was identified with any other neoplastic disease including carcinoma of the bronchus. (Author abstract modified)

56414 **APTIC NO. 80729**

Eickenroht, Edmund Y., Emily M. Gause, and John R. Rowlands

THE INTERACTION OF SO2 WITH PROTEINS. *Environ. Letters, 9(3):265-277, 1975. 10 refs.*

The effects of sulfur dioxide, bisulfite ion, and sulfuric acid on the fluorescence behavior of tryptophan residues and a sulfhydryl specific label in proteins are compared. Egg white lysozyme, human albumin, human lymphocytes, and rabbit alveolar macrophages were studied. Optical and infrared spectra, pH, and calorimetric measurements were made. Evidence was found for a reaction of SO2 in biological systems which is characteristic and different from that of the bisulfite ion, for the strong quenching of tryotophan fluorescence in the protein environment by SO2 is not matched by bisulfite or acids. The quenching of protein fluorescence is due to direct interaction of SO2 with the tryptophan residues, rather than conformational or structural alterations elsewhere. The evidence suggests that electron accepting properties of SO2 itself may play an important role in interaction with a number of different biological macromolecules.

56415 **APTIC NO. 80556**

Epstein, F. H. and G. Schuler

ENVIRONMENTAL FACTORS AND CARDIOVASCULAR DISEASES. *(Umweltfaktoren und kardiovaskulaere Krankheiten). Text in German. Soz. Praeventivmed., 20(2):83-88, 1975. 70 refs.*

Epidemiological studies have clearly shown that the way of life has a decisive influence on diseases caused by atherosclerosis. It is less apparent whether and to what extent the physical environment may play an additional aetiological role. There are factors in the water which presumably affect these diseases but the responsible substances and operative mechanisms remain to be defined. There is no certainty whether the weather exerts an influence which is independent of the water factor. Although carbon monoxide in the ambient air is less important that smoking in determining the carboxyhemoglobin concentration in the blood, and consequent cardiovascular changes, air pollution constitutes an additional source of carbon monoxide which may be a substantial hazard particularly in industry and for persons with latent atherosclerosis.

56416 **APTIC NO. 79913**

Feldman, Y. G. and N. D. Exler

ASSESSMENT OF THE ACTION OF ATMOSPHERIC POLLUTIONS ON THE ELECTRIC ACTIVITY OF THE CEREBRUM. *Text in Russian. Gigiena i Sanit., no. 9:11-14, 1975. 7 refs.*

The effects of atmospheric pollution on the electrical activity of the cerebrum were investigated. The deteroriation of the reaction of rearrangement of rhythm in reply to a rhythmical light stimulation, accompanied by a change of the total electrical activity is assessed as an index of the noxious action of toxic substances on the function of the central nervous system. This reaction is used in examinations of man in determining hygienic standards for atmospheric pollution.

56417 **APTIC NO. 73658**

French, Jean G.

EPIDEMIOLOGY AND CLINICAL MANIFESTATIONS OF DISEASE ASSOCIATED WITH EXPOSURE TO EMISSIONS FROM COAL AND OIL SHALE UTILIZATION. *Preprint, Cincinnati Univ., Ohio, Dept. of Environmental Health, National Inst. of Environmental Health Sciences, and the National Inst. for Occupational Safety and Health, 21p., 1975. 33 refs. (Presented at the Workshop on the Health Effects of Coal and Oil Shale Mining, Conversion and Utilization, Cincinnati, Ohio, Jan. 25, 1975.)*

The epidemiological and clinical implications of exposure to emissions from increased coal and oil shale utilization are discussed. Combustion products considered include: sulfur dioxide, sulfates, sulfuric acid aerosol, nitrogen oxides, nitrates, polynuclear hydrocarbons, carbon monoxide, aldehydes, and various toxic trace elements (beryllium, fluorine, arsenic, selenium, cadmium, mercury, and lead) found in fly ash. Epidemiological studies indicate that prolonged exposure to nitrogen dioxide levels of 117-205 micrograms/cu m can contribute to increased prevalence of chronic bronchitis, acute lower respiratory disease, and diminished pulmonary function. Associations between asthma attacks and levels of suspended nitrates and sulfates also exist. Human chamber studies indicate that ozone in the presence of SO2 is more irritating than ozone alone. Animal studies demonstrate high toxicities for sulfuric acid mists and various sulfate compounds which are products of the atmospheric transformation of SO2. Purified polycyclic compounds produce tumors of the trachiobroncholar tree or lung parenchyma when absorbed on particles and delivered below the larynx. The increased processing of oil shale appears to offer even greater potential than coal combustion for increasing levels of hydrocarbons, nitrogen oxides, and photochemical oxidants.

56418 **APTIC NO. 80725**

Gause, E. M. and J. R. Rowlands

EFFECTS OF SULFUR DIOXIDE AND BISULFITE ION UPON HUMAN LYMPHOCYTE MEMBRANES. *Environ. Letters, 9(3):293-305, 1975. 15 refs.*

Results are presented of a spin label study of the effects of sulfur dioxide upon lymphocyte membranes. A cloned continuous line of human diploid lymphocytes from a nonmalignant source was used. The labelling procedure is described. An electron spin resonance spectrometer was used. Spectra of the labelled lymphocytes are given. Results are consistent with a label binding site on the lymphocyte which is protein or glycoprotein, separated from or not normally interacting with membrane surrounded by the aqueous extracellular medium, physically separated from or not normally interacting with membrane lipid bilayer regions, and normally entirely extracellular. Possibly these sites include membrane bound IgM molecules. Despite the fact that the SO2 exposures were also bisulfite exposures to varying degrees, there were consistent indications of small differences between cells exposed to the SO2 and those exposed to the bisulfite solutions.

56419 **APTIC NO. 73609**

Gillette, Donald G.

AMBIENT OXIDANT EXPOSURE AND HEALTH COSTS IN THE UNITED STATES - 1973. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab., 23p., 1975. 17 refs.*

The health costs resulting from ambient oxidant exposure in the United States are estimated for year 1973. Hourly oxidant or ozone concentrations were measured at approximately 400 monitoring stations, and the estimated health costs were derived from data relating adverse health effects to hourly oxidant concentrations. Approximately 10% of the American population resided in areas where the hourly primary standard for oxidants of 160 micrograms/cu m was exceeded more than 5% of the hours in a year during the 1971-1973 period. The total annual health cost attributable to oxidants was estimated to range from $120 to over $240 million in 1973. (Author abstract modified)

56420 **APTIC NO. 80569**

Goldbaum, Leo R, Ruben G. Ramirez, and Karel B. Absalon

JOINT COMMITTEE ON AVIATION PATHOLOGY: XIII. WHAT IS THE MECHANISM OF CARBON MONOXIDE TOXICITY? *Aviat. Space Environ. Med., 46(10):1289-1281, Oct. 1975. 9 refs.*

The toxic action of carbon monoxide was studied. Five dogs were administered 13% CO by inhalation from a rebreathing bag. Five other dogs were bled to an anemic state, with the hemoglobin content reduced by an average of 68%, and infused with solution to maintain the blood volume. A third group of five dogs were bled to the same anemic state but were transfused with carboxyhemoglobin red cells to replenish their total red cell mass. Dogs from the first group died in 15 min to 1 hr with COHb levels of 54% to 90%. The second group of dogs survived for an indefinite period of time. The third group survived indefinitely with measured COHb levels of 60%. Anemic dogs with reduced Hb and anemic dogs transfused with COHb showed no toxic symptoms. The entry of CO into tissue cells must have a different explanation than from the dissociation of COHb. The mechanism of CO toxicity probably involves its combination with the cytochromes rather than the reduction of the oxygen transport capacity of the blood.

56421 **APTIC NO. 80552**

Goldsmith, John R. and Wilbert S. Aronow

CARBON MONOXIDE AND CORONARY HEART DISEASE: A REVIEW. *Environ. Res., 10(2):236-248, Oct. 1975. 38 refs.*

The most vulnerable target organ for low level carbon monoxide exposure appears to be the heart. There are five ways in which carbon monoxide at commonly occurring levels can affect cardiac function, or the occurrence and severity of coronary heart disease. Aggravation of angina pectoris occurs following exposure to 50 ppm of CO after 90 min. Anginal patients also show depression of the forcefulness of contraction, a negative inotropic effect. Aggravation of intermittent claudication occurs after exposure to 50 ppm of CO for 120 min. Alterations of the elctrocardiogram will occur in normal subjects following exposure to 100 ppm of CO after 4 hr exposure. This effect has been also observed in certain occupations where exposure to CO is high, such as fire fighters. Atherosclerosis may be produced or aggravated by carbon monoxide from smoking. Survival may be impaired in patients with acute myocardial infarction. A role for carbon monoxide in the development of stroke and in cerebral atherosclerosis is probable. (Author abstract modified)

56422 **APTIC NO. 73267**

Hower, J., B. Prinz, E. Gono, and H. -G. Bohlmann

SIGNIFICANCE OF LEAD IMMISSION FOR PREGNANT WOMEN AND NEONATES IN THE RUHR AREA. *(Die Bedeutung der Blei-Immissionsbelastung fuer Schwangere und Neugeborene im Ruhrgebiet). Text in German. Deut. Med. Wochenschr., 100(10):461-463, March 1975. 13 refs.*

Systematic measurements of lead levels in blood samples taken from 176 mature and premature neonates and 59 mothers in the western Ruhr-Rhine area in West Germany demonstrated that at least 30% of statistical variance in blood lead levels was dependent on the ambient lead concentrations at the mother's place of residence, as determined by grass exposure tests. Close correlation was established between the maternal and neonatal blood lead levels. The blood lead level in neonates averaged 13.3 micrograms/dl at a standard deviation of 4.6 micrograms/dl, at a standard deviation of 4.6 micrograms/dl, while the average lead level in maternal blood was 14.8 micrograms/dl. A correlation factor of 0.960 was established for the blood lead levels in homozygous and heterozygous twins. The grass exposure test can be used to evaluate blood lead levels.

56423 **APTIC NO. 81013**

Ichikawa, I. and E. Yokoyama

EFFECTS OF CARBON PARTICLES AND OZONE ON CATHEPSINS AND ACID PHOSPHATASE ACTIVITIES IN RABBIT ALVEOLAR MACROPHAGES. *(Kato haiho macrophage ni okeru cathepsin oyobi acid* *phosphatase kassei ni taisuru tansoryushi oyobi ozone no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):475, Nov. 1975.*

Carbon particles (0.5%) in physiological saline were injected into the lungs of male rabbits via the trachea (5 ml/g of the lung) for 2 days. The rabbits were then exposed to ozone at 1 ppm for 3 hours. The lungs were removed and the cells in the lung were washed out with physiological saline, collected, and after adjusting to a standard concentration they were incubated for 2 hours. The number of macrophages in the group injected only with carbon particles increased significantly compared to the control. The macrophages of the group injected and exposed also increased over the control; however, there was less increase than for the group injected only carbon particles. The relative activity of cathepsins at pH 3.5, 2.8 and 5.0 became, respectively, lower, higher, and higher in the group injected only with carbon particles, compared to the control. An increase of relative activity in the macrophages of the group injected and exposed was conspicuous at pH 2.8. The relative activity of cathepsins in the culture medium of phages in the group injected and exposed was extremely high at pH 2.8, 3.5 and 5.0. Acid phosphatase activity of the phages increased significantly in groups injected with carbon particles, and increased more in groups injected and exposed; however, no change was found in the culture medium after culturing.

56424 **APTIC NO. 79954**

Kawabata, Junichi, Yoshiaki Chiba, Toshifumi Tsuzuki, Kazuyoshi Fukuda, Mikio Yamada, and Kazuko Matsuda

HEAVY METAL CONTENTS IN HUMAN HAIR AS AN INDEX OF ENVIRONMENTAL POLLUTION. *(Kankyo osen shihyo to shiteno tohatsuchu ju-kinzoku nodo). Text in Japanese. Hokkaido Ritsu Eisei Kenkyushoho (Rept. Hokkaido Inst. Public Health), no. 25:105-116, June 1975. 7 refs.*

The heavy metal content of the hair of inhabitants in a town where air pollution is slight was compared to the hair of inhabitants in Wanishi, Muroran City, where air pollution due to heavy metals affected the health of the inhabitants. The heavy metals considere were copper, lead, zinc, cadmium, manganese, iron and mercury. The logarithm of analytical data (for 60 subjects in the town and 58 in Muroran) was plotted against accumulated frequency. A difference o concentration between the 2 places was noticed for iron, manganese, copper, and zinc; these were higher in Muroran. The high content o zinc in women s hair might have been due to hair dye. The unusuall high manganese content of women s hair also might have been due to hair dye. In men s hair, there was a high correlation between iron and manganese contents.

56425 **APTIC NO. 79939**

Kikuchi, K., O. Takayama, E. Ishiyama, and A. Katano

EFFECTS OF AIR POLLUTION ON THE FOLLICLES IN THE PHARYNGEAL POSTERIOR WALL: PATHOHISTOLOGICAL AND ELECTRONMICROSCOPIC STUDIES OF THE FOLLICLES. *(Taikiosen no intokoheki roho ni oyobosu eikyo: sono byorisoshikigakuteki oyobi denshikenbikyo-teki kenkyu). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan Broncho-Esophagolog. Soc.), 26(5):269, Oct. 1975.*

Lymph follicles taken from patients suffering nasopharyngitis and those taken from inhabitants of air polluted areas were compared pathohistologically and electronmicroscopically. In cases of nasopharyngitis of younger people, infiltration of lymphocytes into the subepithelial tissue with dilated vessels accompanied by wandering leucocytes was observed. In cases of older people, a tendency to epithelial fall out was observed. In cases of air pollution, the infiltration of lymphocytes and epithelial fall out appeared regardless of age. The pathological change of follicles i the pharyngeal posterior wall proved to be chronic inflammation.

56426 **APTIC NO. 81009**

Mezawa, H.

COUNTERMEASURE ACTIONS OF IWAKI MUNICIPAL MEDICAL ASSOCIATION. *(Iwaki ishikai no kogai taisaku katsudo). Text in Japanese. Koshu Eisei Public Health), 39(9):600-608, 1975. 5 refs.*

Environmental pollution due to industrialization in the Onahama area of Iwaki City was studied by the medical association to identify the effects of pollution due to dusts from factories. The association carried out a survey to determine the morbidity of obstructive pulmonary diseases, involving medical examination of inhabitants of the city and a special medical examination of schoolchildren. The morbidity for males was 3.2% and for females 2%. The morbidity of inhabitants with respiratory system impairment was 4%-8% in the Onahama area and 3%-4% in the Nakoso area (in Iwaki City), compared to 2% in a non-polluted area. These results clearly indicate that the inhabitants around the industrial zone in Iwaki City suffered damage due to air pollution.

56427 **APTIC NO. 80644**

Miller, Stephen G.

APPENDIX 5. AIRBORNE SULFURIC ACID AEROSOL TOXICOLOGY. *In: An Analysis of the Automotive Sulfate Question. Energy and Environmental Analysis, Inc., Arlington, Va. and AVRAM Co., Falls Church, Va., Manufacturers of Emission Controls Association Contract, 20p., 1975. 29 refs.*

The toxicity of airborne sulfuric acid aerosol is reviewed. Animal mortality studies indicate that median lethal dose values are on the order of 25,000-60,000 microgram/cu m, with death being attributable to severe constrictions of the larynx, trachea, and bronchi. Short-term animal pulmonary function and pathological investigations at sulfate levels of 150-10,000 microgram/cu m reveal increases in airflow resistance of between a few percent and 300%. The lowest long-term (2 yr) H2SO4 exposure level at which any airflow resistance changes are observed is 100 microgram/cu m. Histopathological changes in animals are observed after long-term H2SO4 exposures of about 2000 micrograms/cu m. Airflow resistance increases in humans ranging between 35 and 150% are observed after 1-hour exposures to between 20,000 and 40,000 microgram/cu m. Up to 20% airflow resistance increases occur after 1-hour exposures to 350-500 microgram/cu m. The toxicity of sulfuric acid aerosol appears to be dependent on particle size, with larger particles being more toxic at high aerosol concentrations and smaller particles being more toxic at lower concentrations. (Author summary modified)

56428 **APTIC NO. 80646**

Miller, Stephen G.

APPENDIX 1. CRITIQUE OF EPA AUTO SULFATE RISK-BENEFIT ANALYSIS DATED FEBRUARY 1, 1975. *In: An Analysis of the Automotive Sulfate Question. Energy and Environmental Analysis, Inc., Arlington, Va., and AVRAM Co., Falls Church, Va., Manufacturers of Emission Controls Association Contract, 20p., 1975. 3 refs.*

The Environmental Protection Agency s auto sulfate risk-benefit analysis is critically reviewed. The study makes no attempt to factor in future automobile sulfuric acid controls which are necessary to meet stringent nitrogen oxide standards. It also overestimates H2SO4 auto-related exposures by using the highest possible H2SO4 emission factors, although these are not applicable to the regions of highest population density. Exceedingly weak dose-response functions are used, many of which are based on studies where sulfates could not be separated from other pollutants. Finally, automobile H2SO4 emissions are given a disproportionate blame for calculated adversed effects when in reality they account for only a small percentage of the total human sulfate exposure. Sulfuric acid exposure levels from autos are overestimated by up to a factor of 7.5 as a result of errors in carbon monoxide exposures and the use of high-speed emission factors in areas where CO emission densities are greatest.

56429 **APTIC NO. 80506**

Moll, Walter

VINYL CHLORIDE DISEASE. *(Zur Vinylchlorid-Krankheit). Text in German. Forum Umwelthyg., 1(8):235-236, 1975. 15 refs.*

General and industrial hygienic problems of vinyl chloride are discussed. The prevalence of angiosarcoma of the liver, a rare tumor with long latency time, and of lung cancer and brain tumor (60% and 320% over the general population), as well as of toxic liver injuries among workers occupationally exposed to vinyl chloride has prompted intense research on the carcinogenic and mutagenic effects of vinyl chloride, and made it necessary to envisage a drastic reduction of the MAC value, and a ban on its use as a propellant for household and pharmaceutical sprays in many countries, especially in the USA and West Germany. A non-detectable level (below 1 ppm) was demanded for in-the-air concentrations of vinyl chloride by the U. S. Occupational Safety and Health Administration in 1974. It is possible to reduce the vinyl chloride concentration in the air of production plants by exhaust and adsorption on activated carbon.

56430 **APTIC NO. 80551**

Morgan, A., J. C. Evans, R. J. Evans, R. F. Hounam, A. Holmes, and Susan G. Doyle

STUDIES ON THE DEPOSITION OF INHALED FIBROUS MATERIAL IN THE RESPIRATORY TRACT OF THE RAT AND ITS SUBSEQUENT CLEARANCE USING RADIOACTIVE TRACER TECHNIQUES. II. DEPOSITION OF THE UICC STANDARD REFERENCE SAMPLES OF ASBESTOS. *Environ. Res., 10(2):196-207, Oct. 1975. 10 refs.*

The distribution of fiber deposited during 30 min inhalation exposure of rats to the Union Internationale Contre Le Cancer (UICC) standard reference samples was investigated. These samples were made radioactive by neutron irradiation, which enabled the amount of asbestos in various tissues to be determined radiometrically. The total amount of fiber deposited varied from 31 to 68% of that respired and, on average, 17% remained in the alveoli and conducting airways up to and including the trachea at the end of exposure. Activity median aerodynamic diameters(AMADs) of the materials used were measured with the cascade centripeter. Differences in the total deposition of inhaled fiber, and in the distribution of deposited material, were correlated with the AMADs of the various samples. Autoradiographs of lung sections showed that at the termination of exposure, fiber was present in the conducting airways, particularly at bifurcations, and also distributed relatively uniformly throughout the alveolated regions. (Author abstract)

56431 **APTIC NO. 79923**

Morita, M., S. Mimura, G. Ohi, H. Yagyu, and T. Nishizawa

A SYSTEMATIC DETERMINATION OF CHLORINATED BENZENES IN HUMAN ADIPOSE TISSUE. *Environ. Pollut., 9(3):175-179, Nov. 1975. 7 refs.*

Human adipose tissue samples were obtained at general hospitals and medical examiner s offices in central Tokyo. Identification of materials was made by mass fragmentography with a sample extracted from a mixture of fifteen adipose tissues and cleaned by steam distillation and sulfuric acid treatment. Liquid gas chromatograph was used for quantitative analysis. Three chlorinated benzenes wer found: 1,4-dichlorobenzene, 1,2,4,5-tetrachlorobenzene, and hexachlorobenzene. Their mean residual levels were 1.7 microgram, 0.019 microgram, and 0.21 microgram/g fat, respectively. Other isomers of chlorinated benzenes were not demonstrably above the level of 0.010 microgram/g fat. (Author abstract modified)

56432 **APTIC NO. 79944**

Nakajima, Toshiro

EFFECT OF AIR POLLUTION ON THE HUMAN HEALTH. *(Taikiosen no kenko ni oyobosu eikyo). Text in Japanese. Iryo (Medical Treatment), 29(9):885-890, Sept. 1975.*

The chronic effects of smog in Yokkaichi and Keihin are described. The major air pollutants such as floating dust, sulfur oxides, nitrogen oxides, photochemical reaction products such as ozone, peroxyacetyl nitrate and aldehydes, and carbon monoxide, hydrocarbons, and other substances and their human effects are enumerated. The relation between air pollution and meteorological factors should be considered. Air pollution in Japan is described in terms of the nature causes of respiratory diseases, especially chronic bronchitis and bronchial asthma. Medical treatment of air pollution in Oita City is discussed.

56433 **APTIC NO. 81015**

Nakajima, T.

DISEASE CONSTRUCTION IN TSURUSAKI AREA OF OITA PREFECTURE. *(Oita-shi tsurusaki chiku ni okeru shippei kozo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):491, Nov. 1975.*

A study was begun in 1962 to determine whether the incidence of disease among residents of Tsurusaki, neighboring the Oita coastal industrial zone, has changed since the beginning of the industrial operation. New cases of diseases related to air pollution were studied in 1972 and 1973. The concentration of sulfur dioxide and falling dust showed no conspicuous change for 10 years. The morbidity of the particular diseases studied during 3 years (1962-1964) averaged 35.7%; in 1965 it became 46.7%. The increase continued until a 1970 high of 55.3%; since then it has decreased to 43.3%, in 1973. The total morbidity of pulmonary diseases showed no conspicuous change; however, that of otorhynolaryngeal diseases increased to 3 times that of 1962. The mortality of ophthalmological diseases showed no change. The effect of the operation of the Shin-nittetsu (the major factory in the zone) on the disease profile of the area was not identified.

56434 **APTIC NO. 79941**

Nakashima, T.

EFFECTS OF AIR POLLUTION ON HUMAN HEALTH. *(Taikiosen no kenko ni oyobosu eikyo). Text in Japanese. Iryo (Medical Treatment), 29(9):885-890, Sept. 1975.*

A general description of the effects of major air pollutants such as floating dust, sulfur oxides, nitrogen oxides, and photochemical reaction products represented by oxidants such as ozone, aldehydes and peroxyacetyl nitrate, carbon monoxide, hydrocarbons, chlorine, hydrogen fluoride and hydrogen sulfide is given. Air pollution and its human effects in Japan are described, including the causes of respiratory diseases, especially chronic bronchitis, bronchial asthma, and lung cancer. The necessity of epidemiological investigation in studying the effects of air pollution on human health is emphasized, citing cases in the Tsurusaki industrial zone in Oita Prefecture. It is also emphasized that the effects of increased air pollution in so small a country as Japan can be severe. The necessity of control of the total amount of exhaust is stressed.

56435 **APTIC NO. 80824**

Nau, Carl A.

HEALTH STUDIES RELATING TO CARBON BLACK. *In: Conference Proceedings on Environmental Aspects of Chemical Use in Rubber Processing Operations, Akron, Ohio, Texas Univ., Galveston, and Oklahoma Univ., Oklahoma City, School of Medicine, Rept. EPA-560/1-75-002, p. 118-129, March 12-14, 1975. 11 refs.*

Health studies relating to carbon black exposure are reviewed. Furnace carbon black, a product of the incomplete combustion of gas, oil, and oil sludges, possesses adsorbed polycyclic aromatic components which can be desorbed by various solvents. Furnace carbon black may be ingested, injected subcutaneously, or applied to the skin of mice without detectable changes from the normal. The desorbed components when ingested, injected subcutaneously, or applied to the skin of mice produce tumors. The inhalation of furnace carbon black by mice or rhesus monkeys leads to the accumulation of carbon black within the lung without damage to pulmonary function. It also leads to electrocardiographic changes indicative of right atrial, septal, and right ventricular hypertrophy. An increase in heart weight may also be observed. No tumor formation is observed in the lungs or elsewhere. Epidemiologic investigations of men working with carbon black for 17 yr reveal that the observed death rate from cancer as well as the morbidity rate is no higher than for other comparable populations. (Author abstract modified)

56436 **APTIC NO. 80857**

Newman, James R.

ANIMAL INDICATORS OF AIR POLLUTION. *Inst. of Environmental Sciences, Mt. Prospect, Ill., Inst. Environ. Sci. Energy Environ., Annu. Meet., 21st, Anaheim, Calif., 1975, p. 152-154. 5 refs. (April 13-16.)*

An analysis of the feasibility of using animals as biological indicators of air pollution is presented. Most animals found to be potential biological indicators are fairly common in the environment, and all are easily sampled. Some groups like domestic animals and zoo animals are particularly easy to monitor; game animals which represent more natural conditions are also easy to monitor. The four best responses of biological indicators used for providing specific information on specific pollutants are: physiological changes observed at autopsy or during histological examination, residue accumulation, changes in blood chemistry and physiology, and changes in the morphology or appearance of the animal. Air pollutants can be generally classified in terms of being permanent accumulators, temporary accumulators, and non-accumulators. A list of possible biological indicators of air pollution is provided and includes the following air pollutants: carbon monoxide, fluoride, hydrogen sulfide, nitrogen dioxide, sulfur dioxide, arsenic, lead, molybdenum, particulates, photochemical oxidants, selenium, and vanadium.

56437 **APTIC NO. 81011**

Ogima, I.

AIR POLLUTION AND RESPIRATORY SYSTEM. *(Taikiosen to kokyuki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):189-195, Nov. 1975.*

Problems of air pollution and respiratory disease are reviewed from the viewpoint of host/agent relationships. In almost all cases of air pollution, the agents are complex. The concentration of pollutants in the air is generally far less than the threshold value; but in some cases it becomes extremely high and can cause injuries, due to meteorological interaction with topography. Complication due to the host include: sensitivity; disposition or internal causes such as age, sex, and smoking history; allergic disposition; the presence of other diseases, especially respiratory ones; the mobility and mental state of the victim. The relationship between host and agent is explained with disease models, including those for chronic bronchitis, bronchial asthma, pulmonary ephymsema, small airway disease, interstitial pneumonia pulmonary, fibrosis, and lung cancer. Characteristic features of respiratory disorder due to air pollution are discussed.

56438 **APTIC NO. 81016**

Sebayashi, T., Y. Okamoto, K. Ozaki, and T. Tsukamoto

INVESTIGATION OF RESPIRATORY RESISTANCE OF SCHOOLCHILDREN AND AIR POLLUTION PART 3. *(Gakudo no kokyuteikochosa to taikiosen Part 3). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):492, Nov. 1975.*

A mass medical examination of schoolchildren was carried out with questionnaires for subjective symptoms and clinical examination of respiratory resistance. Those who showed respiratory resistance (Rr) values over the normal threshold, or fluctuating Rr values were further examined for vital capacity and 1-second volume. The subjects were selected from 9 schools in air polluted areas, and 3 schools in non-polluted areas. The frequency of complaints of susceptibility to catching cold throughout the year was especially high for children in the school in the highly polluted areas. The percentage deviation from the regression curve for Rr value related to body height was higher for children in schools located in polluted areas. Air pollutants other than sulfur oxides, or other environmental factors, are the probable cause of these findings.

56439 **APTIC NO. 80539**

Staal, E. M., W. Bree, and P. L. C. A. Rijnbeek

COUGH IRRITATION BY DEORDORANT SPRAYS. *J. Soc. Cosmetic Chemists, 26(10):509-522, Oct. 1975. 9 refs.*

The causes of respiratory irritation provoked by deodorant sprays were investigated and the irritant potential of several deodorant spray formulations was determined. The spray formulae consist of fatty substances, perfume, bactericides, solvents, and propellant in various quantities. A Consumer Test Method was developed which derives the average value for a numerical rating given by a number of test subjects, with respect to the composition being investigated. The main cough stimulants in deodorant sprays were antimicrobial agents. (Author abstract modified)

56440 **APTIC NO. 81018**

Suzuki, Y., S. Sakurai, K. Itai, S. Nakaya, K. Yazaki, and F. Tsunoda

EXPOSURE EXPERIMENTS OF GOATS TO ENVIRONMENTAL POLLUTION DUE TO FLUORINE IN AIR PART VII. FLUORINE CONTENT OF ITS TISSUES. *(Taikichu fukkabutsu no kankyoosen ni yoru yagi no bakuro jikken Part 7. Soshiki no fusso ganyuryo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):481, Nov. 1975.*

Goats were reared in an area where the concentration of hydrogen fluoride in the air was 0.5-1.0 ppb, and their 7th thoracic vertebra, the central part of the rib, the ilium, and the muscles of the haunch were analyzed for fluorine by an ion electrode method. The fluorine content of the thoracic vertebra and rib was 545-570 ppm just after birth, four times greater than for the control group, and it increased markedly with time, reaching in 3 months the level which the control group attained in 3 years. After 3 years, the fluorine content became 8000 and 6000-7000 ppm in the thoracic vertebra and in the rib and ilium, respectively, 3.6-4.3 times that of the control. In the muscles, on the contrary, the fluorine content remained at about 1.0 ppm for 3 years, showing no difference with the control. The pollution of goats by fluorine is probably via polluted pasturage rather than inhalation.

56441 **APTIC NO. 79940**

Takayama, O., Y. Oshio, T. Suzuki, T. Ikematsu, and H. Saito

EXAMINATION OF OBJECTIVE CLINICAL FINDINGS IN UPPER AIRWAY PROBABLY DUE TO PHOTOCHEMICAL SMOG. *(Kokagakusmog ni yoru to omowareru jokido takakuteki rinshoshoken no kento). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan Broncho-Esophagolog. Soc.), 26(5):298, Oct. 1975.*

The upper airway of people exposed to an episode of photochemical smog was determined. Results were compared to findings in the uppe airway in smogless weather. Subjects were schoolchildren in polluted and non-polluted areas. Stimulation of the mucosa in the upper airway was found to accompany cases of exposure to smog.

56442 **APTIC NO. 80984**

Winkelstein, W., D. Byar, W. DeWys, S. Shain, F. Rapp, H. Rosenthal, M. Jackson, M. Heshmat, Z. Hruban, M. Webber, M. Pollard, R. Gittes, M. Tannenbaum, W. Voight, W. Panko, M. Kaighn, J. Horoszewicz, G. Sato, P. Siiteri, D. Lubaroff, L. Dmochowski, and K. Maruyama

GENERAL DISCUSSION: ETIOLOGY AND PREVENTION OF PROSTATIC CANCER. *Cancer Chemother. Rep., 59(1):73-87, Jan.-Feb. 1975. 12 refs.*

The relationship between air pollution and prostatic cancer is discussed. In the two major studies of air pollution and diseases in the United States (Nashville, Tenn. and Buffalo, N. Y.), a substantial association between levels of particulate pollution and distribution of prostatic cancer in the community was demonstrated. This association was not universal for all cancers but was the same in both communities for stomach cancer and prostatic cancer.

56443 **APTIC NO. 81014**

Yoshida, A., K. Motomiya, and M. Adachi

CLINICOEPIDEMIOLOGICAL STUDY ON SCHOOLCHILDREN S BRONCHIAL ASTHMA IN FUJI CITY. *(Fuji-shi ni okeru gakudo kikanshizensoku no rinsho ekigakuteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):490, Nov. 1975.*

A two-part study was conducted. The disease history of 134 officially recognized child patients suffering bronchial asthma in Fuji City and 49 child outpatients in Saku General Hospital in Nagano Prefecture were studied. A clinical and immunological investigation was also made of 163 asthmatic children in Fuji and Fujinomiya Cities, in areas classified by the degree of air pollution: high (more than 0.06 ppm), moderate (0.05 - 0.04 ppm), and low (less than 0.03 ppm). The investigation of the clinical profiles, including such factors as family history, disease history, peripheral acidocytes, intracutaneous reaction, methacholine inhalation test, and immunoglobulin value indicated no substantial local difference in bronchial asthma between polluted areas and non-polluted areas, indicating that the individual predisposition was the basis for the incidence of the disease with deeply involved allergic reaction. It was concluded that air pollution not only has symptom-inducing action, but also accelerates the onset of bronchial asthma.

56444 **APTIC NO. 73198**

Yoshida, Katsumi

EVALUATION OF ENVIRONMENTAL EFFECTS ON AIR QUALITY. *(Taikishitsu ni kansuru kankyo eikyo hyoka). Text in Japanese. Kogai To Taisaku (J. Pollution Control), 11(1):13-18, Jan. 1975.*

The Yokkaichi-Asthma incident, which occurred in the years 1955- 1965 in Japan, and led to far-reaching changes in atmospheric pollution control measures, is discussed. Sulfur oxides from stack emissions of petroleum refineries, power plants, and sulfuric acid manufacturing plants, were the cause of the increase in respiratory ailments. The salient fact of this pollution was that it did not occur during the special meteorological phenomenon of windless, temperature inversion. Rather, it occurred at ordinary times when wind velocities were high, and there was insufficient atmospheric diffusion of pollutants. At wind velocities above 6 m/sec, the average sulfur dioxide concentration 0.7 km from the pollution source was nearly 0.3 ppm. After 1965, emergency remedial measures (construction of higher chimneys and burning of low-sulfur fuel) resulted in a decrease in the number of new respiratory cases arising yearly. Present environmental standards set as the goal a yearly average of 0.017 ppm for SO_2 concentrations. Computer simulations to predict pollution effects in order to prevent recurrence of incidents such as this are discussed.

56445 **APTIC NO. 81017**

Yoshida, K., M. Imai, and M. Kitabatake

EFFECTS OF NITROGEN MONOXIDE AND NITROGEN DIOXIDE ON EXPERIMENTAL ASTHMA OF GUINEA PIGS. *(Morumotto no jikken zensoku ni oyobosu NO, NO_2 no eikyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):468, Nov. 1975. 2 refs.*

One group of guinea pigs was pre-sensitized by exposure to nitrogen monoxide at 5.02 ppm and one by exposure to nitrogen dioxide at 5.00 ppm for 30 min/exposure, 2 times/week for 2 weeks, and then the groups were exposed respectively, to NO and nitrogen dioxide for 30 minutes and sensitized by albumin for 30 minutes 2 times/week. The degree of dyspneal paroxysm was evaluated by the typical respiratory curves. As the time of pre-sensitizational exposure to both NO and nitrogen dioxide increased, a proportional increase of dyspnea was observed. After sensitization by albumin, strong accentuation of dyspneal paroxysm was recognized. It was confirmed from the experiments that the inhalation of NO aggrevated the experimental asthma, as did nitrogen dioxide, and increased the sensitivity of airway-acetylcholine (causing airway hypersensitivity). Exposure to NO showed the same biological activity as exposure to nitrogen dioxide.

56446 **APTIC NO. 73397**

Kanagawa Prefectural Environmental Center (Japan)

STUDIES ON EFFECTS OF SUBSTANCES CAUSATIVE OF PHOTOCHEMICAL POLLUTION ON ANIMALS; SYNERGISTIC ACTION OF ACROLEIN, ETHYL NITRITE, AND OZONE. *(Dobutsu no oyobosu kokagaku kogai genin bushitsu no kenkyu; acurorein to ashosan echiru narabini ozon tono sojo sayo ni tsuite). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanawawa Pref. Environ. Cent., no. 6:47, Feb. 1975.*

Effects of acrolein, ethyl nitrite, and ozone on rabbits were studied by exposing rabbits to these gases and observing the heart, respiratory, and eye movements. No effect was observed when rabbits were exposed to 7 ppm ethyl nitrite for 30 min, however apparent disturbances in heart, respiratory, and eye movements were induced when rabbits were exposed to the gas mixture of 7 ppm ethyl nitrite and 10 ppm acrolein. This disturbance was not observed when rabbits were placed in the exposure apparatus containing only the 7 ppm ethyl nitrite and adding the 10 ppm acrolein later. No effect was seen with 5.3 ppm ozone, but a mixed gas of 5.3 ppm ozone and 10 ppm acrolein caused a disturbance similar to that observed with the gas mixture of ethyl nitrite and acrolein.

56447 **APTIC NO. 79942**

EFFECT OF AIR POLLUTION 1) HEALTH DISTURBANCE BY SEVERAL POLLUTANTS. *(Taikiosen no eikyo 1) Kakushu osenbussitsu ni yoru kenkohigai). Text in Japanese. Kosei no Shihyo (Health Welfare Statistics), 22(9):238-239, 1975.*

Although ocular and nasal mucosa are affected by air pollution, the respiratory system is most affected. The diseases caused by air pollution are chronic bronchitis, bronchial asthma, pulmonary emphysema, asthmatic bronchitis, pulmonary fibrosis, and cor pulmonale. Sulfur oxides, floating dusts containing manganese and beryllium, 3,4-benzpyrene, benz-b-fluoranthene, and their effects are discussed. Effects on humans are divided into chronic and acute; the latter are not so severe in Japan. The chronic effects should be treated more seriously than the acute ones. The combined effect of auto exhaust is explained with respect to photochemical smog, which has claimed 134,000 victims since the first incident in June 1970.

56448 **APTIC NO. 80585**

National Academy of Sciences, Washington, D. C., Committee on Mineral Resources and the National Research Council, Washington, D. C., Commission on Natural Resources

MINERAL RESOURCES AND THE ENVIRONMENT. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 50-79, June 1975. 12 refs. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.)*

GPO

Atmospheric sulfur emissions (sulfur dioxide, sulfuric acid, and sulfates) are discussed in terms of toxicological and epidemiological data on their effects, air quality measurements, and strategies for their control. Globally man generates about one-third of the total gaseous sulfur present in the atmosphere. In realistic concentrations, sulfur dioxide alone appears to be of little consequence; however, when it is combined with an aerosol, an exaggerated irritant response is observed in animals and humans. Segments of the population that are particularly susceptible to the effects of sulfur pollution include the aged, persons with underlying cardiovascular or pulmonary disease, and infants and children. The options available for controlling the total atmospheric loading of sulfur include: reduction in demand for energy and increased efficiency of coal conversion, the use of low sulfur coals, the employment of tall stacks together with intermittent control systems, and the removal of sulfur prior to, during, or after combustion of the fuel.

56449 **APTIC NO. 80643**

Energy and Environmental Analysis, Inc., Arlington, Va. and AVRAM Co., Fall Church, Va.

APPENDIX 6. SULFATE EPIDEMIOLOGY. *In: An Analysis of the Automotive Sulfate Question, Manufacturers of Emission Controls Association Contract, 20p., 1975. 19 refs.*

Epidemiological data linking water soluble suspended sulfates to adverse health effects are reviewed. The most significant epidemiological study of sulfates is the Environmental Protection Agency s Community Health and Environmental Surveillance Study (CHESS). The only conclusion that can be drawn from this study is that suspended sulfate may provide a better indicator of air pollution s impact on human health than sulfur dioxide. There is no direct evidence at the present time that sulfuric acid mist (a soluble sulfate in the atmosphere) exerts an adverse effect on health at levels found in the air. Inferences based on both toxicological and epidemiological studies, however, point to the probability of sulfuric acid being a health hazard at current concentrations. (Author summary modified)

1974

56450 **APTIC NO. 80376**

Amoore, John E.

EVIDENCE FOR THE CHEMICAL OLFACTORY CODE IN MAN. *Ann. N. Y. Acad. Sci., vol. 237:137-143, 1974. 15 refs.*

The development of a chemical olfactory code by the identification of primary odors and their chemical structures is discussed, with experiments being cited for two examples. Studies of people with specific anosmia for the sweaty odor developed by isovaleric acid and its congeners indicate that the anosmic deficiency rises to a plateau between four and seven carbon atoms for straight- chain acids and is epitomized by isovaleric acid. Experiments with individuals who fail to perceive the odor of 1-Pyrroline which resembles that of semen reveal that the molecular requirements for producing the spermous primary odor are very restricted. The odor of 1-pyrroline shows an anosmic deficiency of 6.19 binary steps, while the next higher homologue, 1-piperideine, registers about five steps. Many other aliphatic and cyclic amines and imines only produce a stale fishy odor which anosmics to 1-pyrroline have no difficulty in detecting.

56451 **APTIC NO. 73306**

Aurand, K. and H. M. Wagner

DETECTION AND EVALUATION OF HAZARDS FOR POPULATION GROUPS BY INDUSTRIAL LEAD EMISSIONS. *(Erkennung und Bewertung der Gefaehrdung von Bevoelkerungsgruppen durch industrielle Blei-Emissionen). Text in German. Bundesgesundheitsblatt (Berlin), 17(25/26):390-394, 1974. 4 refs.*

The degree of lead exposure was studied in a screening test in 1500 preschool age children living in the vicinity of a lead smelting plant at Nordenham, Germany, by physical, biochemical, and clinical methods. The mineral content of the bones was determined by absorption measurements, and lead deposits in the knee and wrist bones were investigated by X-ray examination. In addition, the lead content in the blood, the aminolevulinic acid secretion in the urine, the aminolevulinic acid dehydratase activity in the erythrocytes, the erythrocyte protoporphyrin level, the lead content in hairs and teeth, and chromosomal aberration were investigated, and general somatic and neurological investigations were carried out. These investigations revealed abnormally high degrees of exposure in 92 children, most of whom lived within 2000 m from the lead smelter plant. While most parameters studied showed a marked dependence of the degree of exposure on the distance from the smelter plant, there was no correlation between distance and lead deposits in the knee and wrist bones. The lead levels in the blood, and hairs, as well as the reduction of delta-aminolevulinic acid dehydratase were highest in the immediate vicinity of the lead smelter plant. The erythrocyte protoporphyrin and the urinary delta-aminolevulinic acid levels were also true indicators of lead exposure. Oral uptake of lead was found to be of great significance. Sand from sand boxes contained up to 7100 micrograms of lead/100 g.

56452 **APTIC NO. 73231**

Blake, David A. and Gertrud W. Mergner

INHALATION STUDIES ON THE BIOTRANSFORMATION AND ELIMINATION OF (14C)TRICHLOROFLUOROMETHANE AND (14C)DICHLORODIFLUOROMETHANE IN BEAGLES. *Toxicol. Appl. Pharmacol., 30(3):396-407, 1974. 16 refs.*

Inhalation studies on the biotransformation and elimination of the halogenated hydrocarbons trichlorofluoromethane and dichlorodifluoromethane, commonly used as refrigerants and aerosol can propellants, were performed with 4 male and 2 female adult Beagles after short inhalation periods (6-20 min). Radiocarbon-labeled trichlorofluoromethane (1000-5000 ppm by volume) or dichlorodifluoromethane (8000-12,000 ppm by volume) were delivered from Teflon bags, with all exhalations being collected via a nonrebreathing valve in similar bags for 1 hr. Venous blood samples were withdrawn at appropriate times and assayed for fluorocarbon-associated radioactivity. Exhalation bags were assayed for labeled fluorocarbon and radiocarbon-labeled carbon dioxide. Urine was collected for up to 3 days and assayed for radiocarbon-labeled metabolites as nonvolatile radioactivity. Essentially all of the administered fluorocarbon was recovered in the exhaled air with 1 hr. Only traces of radioactivity were found in urine or exhaled carbon dioxide. Tissues for animals sacrificed after 24 hr of exposure contained measurable amounts of nonvolatile radioactivity which represented only 1% of the administered dose. It was not possible to determine whether these trace levels were associated with metabolites of the fluorocarbons or with the unavoidable radiolabeled impurities present in the administered gas mixture. Neither phenobarbital pretreatment (60 mg/day for 3 days) nor prolonged exposure (50-90 min) produced any alteration in the results. The fluorocarbons appeared to be relatively refractory to biotransformation after a short inhalation exposure, being rapidly exhaled in their unaltered chemical form. (Author abstract modified)

56453 **APTIC NO. 79860**

Boecker, B. B., R. G. Cuddihy, F. F. Hahn, and R. O. McClellan

A SEVEN-YEAR STUDY OF THE PULMONARY RETENTION AND CLEARANCE OF CS-137 INHALED IN FUSED ALUMINOSILICATE PARTICLES BY THE BEAGLE DOG. *In: Inhalation Toxicology Research Institute Annual Report. Lovelace Foundation for Medical Education and Research, Albuquerque N. Mex., Inhalation Toxicology Research Inst., Atomic Energy Commission Contract AT(29-2)-1013, Rept. LF-49, p. 48-52, Dec. 1974 1 ref.*

Long-term pulmonary retention and clearance in 30 Beagle dogs given single, 15-minute inhalations of cesium-137-labeled fused aluminosilicate particles (1.5-1.7 micron diameter) were studied. An average of about 60% of the initial body burden was excreted rapidly, primarily in the feces. The remainder was retained for much longer periods. The longest component of whole-body retention showed an associated biological half-life of 580 days in two dogs observed for 7 yr after exposure. Tissue analyses of dogs sacrificed in pairs over periods of up to 7 yr after exposure showe prolonged retention in the lung, transfer of significant quantities to the tracheobronchial lymph nodes, and some soft tissue accumulation of released Cs-137. These data on the long-term retention and translocation to the tracheobronchial lymph nodes are significantly different than those observed previously in dogs exposed to plutonium-239 oxide. (Author abstract modified)

56454 **APTIC NO. 80613**

Doving, Kjell B.

ODORANT PROPERTIES CORRELATED WITH PHYSIOLOGICAL DATA. *Ann. N. Y. Acad. Sci., vol. 237:184-192, 1974. 19 refs.*

Data obtained from previous physiological measurements made on the glomerular layer in the olfactory bulb of the rabbit in response to different odors are statistically analyzed to correlated odorant properties with physiological parameters. Euclidean spaces of several dimensions are created to find which combination of physical parameters best describes the values given in the physiological matrix. The combination of physical parameters giving the best correlation in three dimensions includes adsorption, the partition coefficient (air/oil), and the molecular length. The density and log distribution coefficient between air and water together with the free energy passing from oil to water become important in four and five dimensions. Spaces of four and five dimensions give the best adjustment to the physiological data. Introducing more dimensions to the odor space does not increase the significance and does not give a better fit to the physiological data.

56455 **APTIC NO. 80374**

Dravnieks, Andrew

A BUILDING-BLOCK MODEL FOR THE CHARACTERIZATION OF ODORANT MOLECULES AND THEIR ODORS. *Ann. N. Y. Acad. Sci., vol. 237: 144-163, 1974. 34 refs.*

Olfactory studies with human panelists were performed to determine if simple planar structural chemical formulas contain sufficient information for positive correlations with principal odor properties. Psychophysical properties studied were odor thresholds, the parameters of the psychophysical intensity function that describe the change in odor intensity with odorant concentration, and the parameters that describe the position of an odor in a multidimensional odor classification space. The process was based on an enumeration of the structural elements of odorant molecules into a building block model. The results indicate that the description of the structural molecular characteristics evident from simple structural formulas of odorants contains a surprising amount of information that can be correlated at statistically highly significant levels to the odor thresholds, the odor intensity/concentration function, and the factor coordinates that are used to describe odor quality in terms of the odor quality classification spaces.

56456 **APTIC NO. 73652**

Fairchild, Glen A.

EFFECT OF GASEOUS AND PARTICULATE SULFUR OXIDES ON THE PATHOGENESIS OF RESPIRATORY DISEASE. *Preprint, Science Applications, Inc., 11p., 1974. 9 refs. (Presented at the Definition of an Analytical Framework for Collating Experimental Observations of the Pulmonary Effects from Exposure to Sulfur Oxides Workshop, Palo Alto, Calif., Nov. 25-26, 1974.)*

The effects of gaseous and particulate sulfur oxides on the pathogenesis of respiratory disease is reviewed, with particular emphasis on the interaction between chemical inhalants and airborne microbial infection. Guinea pigs exposed for 60 min to high concentrations of sulfuric acid aerosol and then to a phosphorus-33 labeled and killed streptococcus aerosol (2-6 micron) showed a 22% greater total respiratory deposition rate of the radioactive particles than did controls not receiving H_2SO_4 pretreatment. The increase in particle deposition occurred mainly in the nasopharyngeal-laryngeal region. Other experiments support the hypothesis that the site of deposition or radioactive streptococcus aerosol is associated with altered airflow dynamics in the nasopharynx or larynx. Depending on the particular microorganism, the severity of respiratory infection is affected by the location of infection initiation in the respiratory tract. Chemical inhalants may, in themselves, also create an adverse microenvironment for growing microorganisms. Mice exposed to 2-5 ppm sulfur dioxide were observed to experience less severe influenzal pneumonia than controls. A sufficient information base does not appear to exist for developing meaningful models to predict the effects of sulfur oxides on the pathogenesis of respiratory disease.

56457 **APTIC NO. 80881**

Gregory, I. C.

THE OXYGEN AND CARBON MONOXIDE CAPACITIES OF FOETAL AND ADULT BLOOD. *J. Physiol. (London), 236(3):625-634, Feb. 1974. 32 refs.*

The oxygen capacities of fetal and adult human blood samples were compared by direct measurement of their oxygen and carbon monoxide combining power. Corrections were applied for the presence of carboxyhemoglobin and methemoglobin. There was no significant difference between the oxygen capacity of fetal blood versus that of adult blood as derived from the oxygen and carbon monoxide content; fetal blood values obtained by the two methods were 1.312 and 1.331 ml/g, respectively, while adult values were 1.306 and 1.331 ml/g, respectively. Differences in the values obtained by each of the two methods were significant, however, and the values obtained with each method were significantly different than the theoretical value of 1.39 ml oxygen/g hemoglobin as derived from the molecular weight of hemoglobin. The results suggest that the International Cyanmethemoglobin Standard gives values of hemoglobin concentration which are approximately 6% higher than levels indicated by oxygen combining power. (Author abstract modified)

56458 **APTIC NO. 73571**

Hackney, Jack D.

PHYSIOLOGICAL EFFECTS OF AIR POLLUTANTS IN HUMANS SUBJECTED TO SECONDARY STRESS (FINAL REPORT). *Rancho Los Amigos Hospital, Inc., Downey, Calif., Professional Staff Assoc., California Air Resources Board Contract ARB-2-372, Proj. ARB-7st-325-14, Rept. ARB-R-2-372-74-25, 177p., Sept. 1974. 103 refs.*

NTIS: PB 236151

Adult male volunteers were exposed to purified air or to ozone, alone or in combination with nitrogen dioxide and carbon monoxide, to investigate the physiological effects of photochemical air pollution. Exposure conditions simulated those of a smoggy Southern California summer, including the secondary stresses of heat, exercise, and repeated exposure. Ozone exposures similar to those expected during pollution episodes produced significant decrements in pulmonary function, symptoms sufficient to restrict normal activity, and oxidative changes in erythrocytes. Psychomotor tracking ability and measures of attention were adversely affected by heat but not by O3 exposure. Subjects with a history of cough, chest discomfort, or wheezing associated with allergy or exposure to air pollution were more reactive than subjects without such histories. The addition of NO2 and CO to O3 did not produce additional detectable effects except for slight increases in carboxyhemoglobin levels and small variable decrements in psychomotor performance with CO exposure. The exposure of sensitive subjects to photochemical oxidants at concentrations sometimes achieved in California urban areas appears to be capable of inducing physiological dysfunction and the inability to carry on normal activities. (Author abstract modified)

56459 **APTIC NO. 79861**

Hahn, F. F., G. J. Newton, Karen L. Springstead, and Jean C. Cordes

INFLUENCE OF PARTICLE SIZE ON PHAGOCYTOSIS BY RABBIT ALVEOLAR MACROPHAGES IN VITRO. *In: Inhalation Toxicology Research Institute Annual Report. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Inhalation Toxicology Research Inst., Atomic Energy Commission Contract AT(29-2)-1013, Rept. LF-49 p. 257-260, Dec. 1974. 6 refs.*

Monodisperse aerosols of montmorillonite fused clay particles ranging from 0.32-2.02 micron in diameter were used to test the phagocytic capabilities of rabbit alveolar macrophages in vitro. Free particles were separated from phagocytized particles using ytterbium-169 labeling techniques and the percentage of phagocytosi determined. A greater percentage (20-40%) of the larger particles (0.97-2.02 micron) were phagocytized than smaller particles (0.32-0.35 micron), with the percentage of phagocytosis for the latter being 0-10%. Phagocytosis appeared to be energy dependent and required glycolysis. Oxidative phosphorylation was not necessary for the phagocytosis of these particles by rabbit alveola macrophages. (Author abstract modified)

56460 **APTIC NO. 80757**

Hany, A.

ASBESTOSIS. *(Asbestose). Text in German. Ergeb. Inn. Med., Kinderheilk., vol. 36:19-95, 1974. 302 refs.*

Studies on the general health hazards of asbestos and on its pathogenic effect on the human organisms are reviewed. Depending on the duration and intensity of the exposure, and possibly of the type and length of the asbestos fibers, the inhalation of asbestos can lead to usually progressive lung fibrosis which is lethal in about 40% of all cases. Benign diseases of the pleura can occur with or without lung fibrosis. The alterations of the pulmonary parenchyma and of the pleura are of unknown etiology. The presence of asbestos bodies in the organism is merely an indication of previous exposure. Asbestos, a possibly carcinogenic or at least cocarcinogenic substance, causes malignant lung tumors after latency periods of 20 yr or more. The tumor risk is greatly enhanced by smoking. Bronchial carcinoma is believed to occur mainly after intense exposure, and mesotheliomas in the peritoneum and pleura mostly after low-intensity exposure. Despite the presence of asbestos bodies in the lungs of urban dwellers without occupational exposure, there are no specific data on the harmful effect of the background concentration of asbestos in urban air with respect to the pathogenesis of lung fibrosis and cancer. Reducing the dust concentrations in occupational and non-occupational exposure, and the use of asbestos in permanently bound form are the essential methods available for the abatement of the risks of asbestos.

56461 **APTIC NO. 79873**

Hoegger, D.

THE EFFECTS OF THE EXHAUST FROM CARS ON MAN AND ON ENVIRONMENT. *(Auswirkungen der Autoabgase auf Mensch und Umwelt). Text in German. Ther. Umschau, 31(9):677-682, Sept. 1974. 16 refs.*

General hygienic and toxicological aspects of automotive exhaust components are described with special regard to the situation in Switzerland. The carbon monoxide concentration in street air rapidly decreases with increasing distance and height, and this gas fails to accumulate in the air. Blood carboxyhemoglobin levels below 10% are usually not accompanied by any poisoning symptoms in healthy individuals while COHb levels well below 15% are claimed to impair hearing and visual acuity. Lead, originating mostly from automobile lead, is resorbed in the lungs at rates of 30-40%, against a gastric resorption rate of 5-10%. Symptoms of chronic lead poisoning are practically absent as long as the lead levels in the blood are below 70 micrograms/100 cu cm. The reduction of the lead content in gasoline would lead to an increased fuel consumption, and consequently to increased CO and hydrocarbon emissions, while the addition of benzene as a substitute for lead would increase the emission of carcinogenic polycyclic aromatic hydrocarbons. Air quality monitorings in Switzerland show no real dangers of acute or chronic poisoning by automotive exhaust components.

56462 **APTIC NO. 73442**

Horiguchi, Y., S. Sato, Y. Wada, T. Takahashi, and A. Yamaga

INTERACTION BETWEEN ACROLEIN AND ETHYL NITRITE. *(Akurorein to ashosan echiru no sogo sayo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):342, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 197.)*

The effect of inhalation of acrolein, ethyl nitrite, and ozone is examined in rabbits. Air containing acrolein and ethyl nitrite vapors and ozone is given to rabbits using an inhalation mask, and the effects are determined by electrocardiogram, heart rate, respiratory movement, blood pressure, and eye movement. No apparent effect was observed for rabbits inhaling air containing up to 4 ppm acrolein, or up to 7 ppm ethyl nitrite, or up to 20 ppm ozone; however, small effects in heart rate and respiratory movement were observed in rabbits inhaling air containing 50 ppm acrolein or 50 ppm ozone. When air containing 0.27 to 5 ppm ozone and 10 ppm acrolein or 7 ppm nitrite and 10 ppm acrolein was given to rabbits, apparent disturbance in heart rate and respiratory movement was induced. Apparent disturbance in heart rate, respiratory movement, and eye movement was induced when air containing 7 ppm ethyl nitrite and 10 ppm acrolein was given to rabbits, and under this condition lowered blood pressure and was also noted. Therefore, acrolein is more harmful whenever it is combined with ethyl nitrite or ozone.

56463 **APTIC NO. 79956**

Ichikawa, Isamu and Eiji Yokoyama

BEHAVIOR OF PHOSPHOLIPASE A ACTIVITY IN THE LUNG OF RATS ACUTELY EXPOSED TO OZONE. *(Ozone kyusei bakuro ni yoru rat hai no phospholipase A kassei no kyodo). Text in Japanese. Igaku to Kaimenkassei (J. Jap. Soc. Biol. Interface), 5(2):37-41, 1974. 20 refs.*

Male Wistar rats in the fifth week after birth were exposed to ozon at 2 ppm, for 3 and 6 hours; they were sacrificed by blood-letting, and their lungs were removed. After washing and homogenizing the lungs, the homogenate was centrifuged at 700 G (for 15 min); 8500 G (for 10 min), and 10,500 G (for 60 min). The homogenate, the precipitates of 8500 G and

10,500 G, and the supernatant liquid wer used as the enzymatic liquids. The results of measurement of phospholipase A1 and A2 of the fraction were as follows: (1) Phospholipase A activity in the lung homogenate increased significantly with exposure of the rat to ozone at 2 ppm for 6 hours. (2) The increase of the activity was mainly due to the increase of the activity of the component A2. (3) The activity of phospholipase A2 increased mainly in the cellular particulates fraction and the activity of phospholipase A1 increased mainly in acidic region in the particulates fraction and soluble fraction. (4) A possibility of activation of phospholipase A2 in particulate membranes accompanied by a change of membrane structure due to ozon exposure was suggested, and a possibility of the transferring of phospholipase A1 from lysosome to the supernatant fraction was considered.

56464 **APTIC NO. 73344**

Ishinishi, N.

EPIDEMIOLOGY OF BENZ(A)PYRENE AND LUNG CANCER. *(B(a)P to haigan no ekigaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):143-144, Nov. 1974.*

A historical review of benz(a)pyrene, which is contained in relatively large amounts in the tarry matter of air pollutants and is widely distributed in the environment is presented starting with the quantitative determination by Waller (1952). Although epidemiological study of lung cancer indicated that smoking history, history of exposure to certain harmful substances, and history of living in air polluted areas were the major factors which raise the occurrence and mortality of lung cancer, there is still debate concerning the substance which plays the prominent role among air pollutants. And although epidemiological analysis has been carried out between each of two of the factors, respectively, no such analysis has been done between the three factors. An investigation was carried out of the fatal cases in Kitakyushu and Fukuoka Cities on the basis of smoking history, occupational history in polluted environment, and living history from 1964 to 1969, as well as a comparison of concentration of benz(a)pyrene in both cities. In spite of the 10-fold difference of concentration of benz(a)pyrene between the two cities, there was no difference in mortality due to lung cancer when correction was made for smoking history, occupational history, and age.

56465 **APTIC NO. 79888**

Kanapilly, G. M.

ALVEOLAR MICROENVIRONMENT AND ITS RELATIONSHIP TO THE RETENTION AND TRANSPORT INTO BLOOD OF AEROSOLS DEPOSITED IN THE ALVEOLI. *In: Inhalation Toxicology Research Institute Annual Report. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Inhalation Toxicology Research Inst., Atomic Energy Commission Contract AT(29-2)-1013, Rept. LF-49, p. 15-20, Dec. 1974. 20 refs.*

The alveolar microenvironment and its relationship to the retention and transport into the blood of aerosols deposited in the alveoli are reviewed. The air-blood barrier is relatively thin (less than 1 micron thick), and the major barrier for the passage of solutes across the ABB into the blood may be the alveolar epithelium. Generally the ABB is a semipermeable membrane. Protein molecules are permeable across the ABB at a relatively slow rate via the pinocytotic mechanism. An acellular layer exists between the epithelium and the air in the alveoli, consisting of a surfactant film and a hypophase. Since the acellular layer is the first contact between a depositing material and the alveoli, the general chemical composition and physical dimensions of this acellular laye may exert a significant influence on the retention and transport behavior of a depositing material in the alveoli. Carrier concentration, acidity, and the dispersion of the depositing aeroso may influence the retention kinetics of materials like cerium(III). Precipitate formation may be involved in the alveolar retention of Ce(III). (Author summary modified)

56466 **APTIC NO. 79867**

Kennedy, Ann R. and John B. Little

THE TRANSPORT AND LOCALIZATION OF BENZO(A)PYRENE-HEMATITE AND HEMATITE-PO-210 IN THE HAMSTER LUNG FOLLOWING INTRATRACHEAL INSTILLATION. *Cancer Res., 34(6):1344-1352, June 1974. 26 refs.*

Male Syrian golden hamsters were given intratracheal instillations of polonium-210 and benzo(3-4)pyrene adsorbed onto hematite carrier particles. Hematite-Po-210 produced combined epidermoid and adenocarcinomas in the peripheral lung, while benzo(3-4)pyrene-hematite produced mainly in the epidermoid carcinomas of the major bronchi and trachea. Transport and localization studies revealed that Po-210 acted as a firmly bound insoluble carcinogen which delivered its primary dose to the peripheral lung from particles that were retained in the alveolar duct region. Benzo(3-4)pyrene, on the other hand, acted as a loosely bound soluble carcinogen which left the carrier particles and entered the upper airway epithelial cells during clearance of the particles on the mucous ciliary escalator. Thus, benzo(3-4)pyrene induced central tumors because a significant amoun of the carcinogen reached the upper airway epithelial cells, wherea Po-210 induced peripheral tumors because the major radiation dose was delivered to the alveolar region. (Author summary modified)

56467 **APTIC NO. 80372**

Koelega, Harry S. and E. P. Koster

SOME EXPERIMENTS ON SEX DIFFERENCES IN ODOR PERCEPTION. *Ann. N. Y. Acad. Sci., vol. 237:234-246, 1974. 22 refs.*

Sex differences in odor perception by preadolescent, adolescent, and adult males and females were investigated using the sniff- bottle technique. Sensitivity to odor was measured in terms of numbers of positive (correct) responses. Women showed a greater sensitivity to odors than men for most of the substances tested, with the sex differences being largest for odors that might be considered biologically meaningful. No such differences were found in experiments with prepuberal children and adolescents, however. Possible relationships between growth in sensitivity to biological odors and the role of sex hormones in the process are discussed.

56468 **APTIC NO. 80371**

Laffort, Paul, Francois Patte, and Michel Etcheto

OLFACTORY CODING ON THE BASIS OF PHYSICOCHEMICAL PROPERTIES. *Ann. N. Y. Acad. Sci., vol. 237:193-208, 1974. 42 refs.*

A physicochemical model of the olfaction mechanism in vertebrates is presented. The affinity of an odor stimulus for a receptor is assumed to depend on four molecular properties which may be derived from retention indices on a gas-liquid chromatograph with the use of four suitably chosen stationary phases. Corresponding to these four stimulus properties are four characteristics of the membrane proteins. For adsorption of the stimulus on protein to occur, it is sufficient that one of the four couples of properties corresponds. The membrane depolarization potential of each receptor cell depends on the percentage of proteins adsorbed per unit time. The model predicts that odorous quality depends only on the distribution of the affinities of stimuli for the receptors and that the olfactory threshold is dependent on both the filter effect of the mucus and the affinity for receptor cells.

56469 **APTIC NO. 80981**

Medvedova, H. and V. Cmarko

SOME RESULTS OF THE OBSERVATION OF MORBIDITY OF 0-15 YEAR CHILDREN IN THE AREA POLLUTED BY INDUSTRIAL EXHALATION. *(Nicktore vysledky seldovania chorobnosti 0-15 rocnych deti v oblasti znecistenej priemyselny-mi exhalatmi). Text in Czech. Cesk. Hyg., 19(3):142-148, March 1974. 7 refs.*

Evidence of morbidity in 0-15 year-old children was investigated in an industrial area of Czechoslovakia polluted with arsenic and sulfur compounds. The long term analysis of morbidity in 2568 children showed differences in the disease rate by area of residence. Lower disease rates occurred in children in a control area, while children from the exposed area had higher rates. The frequency of disease was dependent on the environment of the schoolchildren. The incidence of respiratory disease, diseases of the eyes, skin, and subcutaneous tissues in children was markedly lower in the control.

56470 **APTIC NO. 73229**

Murayama, N., Y. Koyama, and Y. Nakagawa

HEALTH OF INHABITANTS AFFECTED BY AUTO EXHAUST, ESPECIALLY THE RELATIONSHIP BETWEEN CO-HB VALUES. *(Jidosha haishutsu gasu osen ni yoru jumin no kenko - tokuni CO-Hb-chi tono kankei ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10)Suppl.:428, Oct. 1974. (Presented at the Japanese Society of Public Health, 33rd Annual Meeting, Fukushima, Japan, Oct. 16-18, 1974.)*

Because of the high percentage of health impairment among the inhabitants around road crossings with frequent traffic jams, determination of environmental carbon monoxide, nitric oxide, nitrogen dioxide, lead, floating dust, noise, temperature, moisture, wind direction and speed, and amount of cloud during 48 hr was carried out two times in 1973 and 1974. The numbers of cars at 10 crossings in Matsumoto and Shiojiri cities were also determined. Meanwhile, questionnaires were collected from the inhabitants around the crossings and compared to those of rural inhabitants, and health examination consisting of carboxyhemoglobin in blood, CO in expired air, lung function, blood pressure, sputum and urinalysis was carried out. The findings were: (1) CO-Hb increased as the CO concentration increased; (2) distribution of CO-Hb in nonsmokers showed local differences, being higher in inhabitants around the crossings than in rural inhabitants; (3) CO-Hb showed an intradiurnal variation, higher in late in afternoon than in morning; (4) health complaints were more frequent in the area where environmental conditions were worse; (5) there is a significant difference between CO-Hb values larger than 1.5% and less than 1.5% regarding health complaints and frequency of morbidity; and (6) at the crossings where the regression coefficient between CO in the air and the number of crossing cars was over 0.01, more than half of the inhabitants around the crossing showed complaints, suggesting that the correlation between CO in the air and the number of crossing cars could be a measure of air pollution.

56471 **APTIC NO. 79848**

Napier, D. H.

ASPECTS OF POLLUTION ASSOCIATED WITH THE PROCESS INDUSTRIES. *Preprint, Imperial College of Science and Technology, London (England), Dept. of Chemical Engineering and Chemical Technology, 24p., 1974 (?).*

Environmental effects associated with gaseous and particulate air pollutants generated by process industries are reviewed. Specific pollutants discussed include: oxygen, nitrogen, carbon monoxide and carbon dioxide, sulfur dioxide, methane, ethylene, hydrogen, ammonia, chlorine and fluorine, nitrogen oxides, ozone, vinyl chloride, hydrogen sulfide, mercury, lead, cadmium, beryllium, cyanides, chlorinated compounds, asbestos, proteolytic enzymes, mutagens, carcinogens, and teratogens. Topics covered include: ih interactions of various pollutants in the environment, methods for the disposal of toxic substances, threshold limit values for the above pollutants, occupational exposure to air pollutants, the introduction of pollutants into the environment, natural sinks for environmental pollutants, and the effects of pollutants on the surrounding flora and fauna.

56472 **APTIC NO. 73535**

Nieburg, Phillip I., Lawrence S. Weiner, Barbara F. Oski, and Frank A. Oski

RED BLOOD CELL DELTA-AMINOLEVULINIC ACID DEHYDRASE ACTIVITY. AN INDEX OF BODY LEAD BURDEN. *Am. J. Dis. Child., vol. 127:348-350, March 1974. 16 refs.*

Red blood cell delta-aminolevulinic acid dehydrase activity was evaluated in terms of its ability to indicate increased lead absorption in children. Simultaneous measurements of blood lead and red blood cell ALAD activity were performed on 20 children who then received chelation treatment with ethylenediaminetetraacetic acid. Inhibition of ALAD activity correlated highly with the amount of lead excreted in the urine, and its measurement was superior to that for blood lead in identifying those children with an increased burden of chelatable lead. (Author abstract modified)

56473 **APTIC NO. 73443**

Oka, Michio, Shigeo Yamaoka, Masanori Fukuda, and Teruo Kanazaki

METAL CONTENTS IN HUMAN HAIR OF RESIDENTS OF OSAKA CITY. *(Osaka-shimin no tohatsu chu kinzoku ryo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):350, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 205.)*

Lead, cadmium, copper, manganese, zinc, and mercury contents in human hair were analyzed by atomic absorption spectrometry. Human hair is collected from both males and females over 50. The human hair collected was classified into two categories; people who lived in center city and those who lived in suburban Osaka. No difference in metal contents was observed by age. Both Pb and Mn levels for those people who use hair dyes were higher than for those who do not use dyes. The Pb, Cd, Cu, and Mn levels were higher in female hair samples than male samples, but the Hg level was higher in male hair. No sex difference in Zn level was found. For the male hair samples, the Pb, Cd, Cu, and Hg were higher in the people who lived in the center city, and their average values were 8.47, 0.34, 14.85, and 4.09 micrograms/g hair, while the corresponding metal levels for the suburban people were 2.95, 0.20, 9.09, and 2.56 micrograms/g hair. For the female hair samples, the Pb, Cd, Cu, and Zn levels were higher for the city people and they were 15.31, 0.65, 29.99, and 177.4 micrograms/g hair, while the corresponding metal levels for the suburban people were 6.91, 0.32, 9.41, and 119.4 micrograms/g hair.

56474 **APTIC NO. 79862**

Phalen, R. F., H. C. Yeh, and D. J. Velasquez

BRONCHIAL TREE STRUCTURE IN THE HUMAN, BEAGLE, RAT AND HAMSTER. *In Inhalation Toxicology Research Institute Annual Report. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Inhalation Toxicology Research Inst., Atomic Energy Commissio Contract AT(29-2)-1013, Rept. LF-49, p. 289-292, Dec. 1974. 5 refs*

Bronchial tube branching angles, lengths, and diameters were measured on replica casts of lungs from humans, dogs, rats, and hamsters. Each cast of silicone moulding compound was cured in the thorax of the subject, checked for artifacts, and hand pruned befor measurement. Significant differences in structure from lobe-to-lob within a lung and with depth within a lobe were observed between species. Human bronchi were longer in relation to their diameters and showed more symmetric bifurcations with respect to diameter ratios and branch angle ratios than bronchi from other species. (Author abstract modified)

56475 **APTIC NO. 73507**

Price, Peter W., Beverly J. Rathcke, and David A. Gentry

LEAD IN TERRESTRIAL ARTHROPODS: EVIDENCE FOR BIOLOGICAL CONCENTRATION. *Environ. Entomol., 3(3):370-372, June 1974. 7 refs.*

Arthropods feeding off of plants and other insects in lead-contaminated areas near heavy vehicular traffic were analyzed for lead accumulation. Average lead levels of the insects ranged between 10.3 and 25.0 ppm in heavily contaminated areas as opposed to average lead concentrations of from 3.3 to 4.7 ppm for insects in low lead areas. Although the insect component of the ecosystem does not act as a reservoir for large quantities of lead, insects do contribute significantly to the flow of energy and pollutants up the food chain, and lead contamination near high emission areas may result in poisoning of insect predators.

56476 **APTIC N[illegible]9863**

Raabe, O. G. and H. C. Yeh

CRITERIA FOR INHALATION EXPOSURE SYSTEMS UTILIZING CONCURRENT FLOW SPIROMETRY. *In: Inhalation Toxicology Research Institute Annual Report. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Inhalation Toxicology Research Inst., Atomic Energy Commission Contract AT(29-2)-1013, Rept. LF-49, p. 303-306, Dec. 1974. 1 ref.*

The design and operation of a new class of inhalation exposure systems utilizing concurrent flow spirometry are described. Concurrent flow spirometry is a simple method for providing real-time measurements of respiratory volumes and rates during inhalation exposure (by mouth or nose) to aerosols or gases. Since CFS systems involve a closed loop, all flows in and out are controlled and metered to provide constant and reproducible exposur conditions. Pressure excursions during the exposure are usually small (less than + or - 0.5 in. of water), and a small negative pressure can be maintained in the system to prevent inadvertent releases of a hazardous atmosphere. The technique is especially useful for inhalation exposures involving larger experimental animals such as horses since whole body plethysmography is usually impractical with such animals. Description of two exposure units with CFS, one for Beagle dogs and one for ponies, are provided. (Author abstract modified)

56477 **APTIC NO. 79882**

Raabe, O. G., H. C. Yeh, G. J. Newton, R. F. Phalen, and D. J. Velasquez

STUDIES OF THE DEPOSITION OF MONODISPERSE PARTICLES IN SMALL RODENTS. *In: Inhalation Toxicology Research Institute Annual Report. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Inhalation Toxicology Research Inst., Atomic Energy Commission Contract AT(29-2)-1013, Rept. LF-49, p. 293-297, Dec. 1974. 1 ref.*

Hamsters and rats were exposed to monodisperse aerosols of spherica aluminosilicate particles labeled with ytterbium-169 to determine the inhalation deposition and organ distribution of particulates in relation to particle size. Studies on 10 animals of each species exposed to aerodynamic equivalent diameters of 3.15, 2.19, 1.14, 0.61, and less than 0.3 micron were conducted. The relative deposition for hamsters increased in the right diaphragmatic lobe and left lung and decreased in the right apical lobe and right cardiac lobe when particle size decreased. The relative deposition in rats increased in the right diaphragmatic lobe and right intermediate lobe and decreased in the right apical lobe and left lung when particle size decreased. This phenomenon is explained by differences in the average path lengths from trachea to terminal bronchi in various lobes. A comparison of data for animals undergoing intermediate and 20-hour sacrifice revealed that the relative amounts of particles in the lobes varied little up to 20 h post-exposure.

56478 **APTIC NO. 80927**

Roberts, T. M., T. C. Hutchinson, J. Paciga, A. Chattopadhyay, R. E. Jervis, J. VanLoon, and D. K. Parkinson

LEAD CONTAMINATION AROUND SECONDARY SMELTERS: ESTIMATION OF DISPERSAL AND ACCUMULATION BY HUMANS. *Science, vol. 186:1120-1123, Dec. 20, 1974. 17 refs.*

A high rate of lead fallout around two secondary lead smelters originated mainly from episodal large particulate emissions from low level fugitive sources rather than from stack fumes. The lead content of dustfall, and consequently of soil, vegetation, and outdoor dust, decreased exponentially with distance from the two smelters. Between 13 and 30% of the children living in the contaminated areas has absorbed excessive amounts of lead as compared with less than 1% in a control group. A relationship between blood and hair was established which indicated that the absorption was fairly constant for most children examined. Apparently the ingestion of contaminated dirt and dusts rather than paint pica was the major route of lead intake. Metabolic changes were found in most of 21 children selected from those with excessive lead absorption; 10 to 15% of this group showed subtle neurological dysfunctions and minor psychomotor abnormalities. (Author abstract)

56479 **APTIC NO. 80784**

Roels, H. A., J. B. Buchet, and R. R. Lauwerys

INHIBITION OF HUMAN ERYTHROCYTE DELTA-AMINOLEVULINATE DEHYDRATASE BY LEAD. IN VITRO ARTIFACT OR REAL PHENOMENON IN VIVO? *Intern. Arch. Arbeitsmed., 33(4):277-284, 1974. 17 refs.*

Results of in vivo and in vitro experiments indicate that the decrease of delta-aminolevulinate dehydratase (ALAD) in human erythrocytes measured under usual environmental and occupational exposure to lead (blood lead concentration less than 120 microgram/ 100 ml) is a true reflection of the enzyme activity in vivo. At blood lead concentrations (Pb-B) below 120 microgram/100 ml, at least three distinct pools of lead (plasma, erythrocyte cytosol, and erythrocyte membrane) exist, which have no influence on ALAD activity as it is measured in the test tube. Only when Pb-B exceeds 120 microgram/100 ml does a fourth lead pool that can inhibit ALAD released by hemolysis of the erythrocytes in the test tube become significant.

56480 **APTIC NO. 80370**

Schiffman, Susan S.

CONTRIBUTIONS TO THE PHYSICOCHEMICAL DIMENSIONS OF ODOR: A PSYCHOPHYSICAL APPROACH. *Ann. N. Y. Acad. Sci., vol. 237:164-183, 1974. 15 refs.*

A model for relating quantitative psychophysical measures of olfactory quality with quantitative physicochemical measures is described. Olfactory data, both psychophysical and neural are ordered in a multidimensional space of low dimensionality, making it possible to reduce an understandable proportion a large range of olfactory qualities. The physicochemical parameters of molecular weight, double bonds, functional groups, cyclic structure, and Raman shifts are weighted mathematically to regenerate the space based on psychophysical measures. (Author conclusions modified)

56481 **APTIC NO. 73398**

Takizawa, Y., T. Oshina, F. Iriyama, and I. Hagima

EVIDENCE OF PULMONARY SHADOWING DUE TO AIR POLLUTION FROM ALUMINUM REFINERY. *(Arumi seiren kojo shuhen no taiki osen to bimansei haiinei byozo no hatsugen). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Ai Pollution), 9(2):349, Nov. 1974.*

The incidence of pulmonary problems in persons over 40, living in Naoetsu Coastal Industrial Area, Japan near the aluminum refinery was investigated by taking lung X-rays. Of 57 persons examined, with high urine fluorine content (greater than 1.2 ppm) and respiratory problems, 42 showed evidence of pulmonary shadowing. The control group (23 persons) had 6 persons with such symptoms. In a factory (polluted area) group of 133 persons, and control group of 32 persons, more cases of pulmonary shadowing and emphysema, percentagewise, were found among the factory area group. Five cases of pulmonary fibrosis were found in a third screening among the factory group.

56482 **APTIC NO. 73400**

Tatsuno, Takashi

HEALTH PROBLEMS WITH VINYL CHLORIDE RESIN. *(Enka biniru jushi no eisei mondai). Text in Japanese. Purasutikkusi Eji (Plastics Age), 20(12):73-78, Dec. 1974. 8 refs.*

Health hazards posed by using vinyl chloride resin and its various additives in food containers are described. The degree of solubility of the container material in the food (aqueous, acidic, alcoholic, and fatty) material can be of prime importance to health. Manufacturing processes in Japan differ from those in the United States. The Japanese process results in less vinyl chloride monomer (VCM) in the end product; consequently more leeway is possible in its use. Nonetheless, the carcinogenic and toxic nature of VCM cannot be disregarded. Phthalic acid ester (mainly, di-2-ethyl hexyl phthalate) is used as a plasticizer with polyvinyl chloride, and its solubility in fatty materials is a cause for alarm. The toxicity of cadmium, lead, and organic tin compounds is already known. More toxicity and solubility data is needed for all the additives that are used with polyvinyl chloride. Tables of food products, solubility data, and toxicity data for humans and laboratory animals are included.

56483 **APTIC NO. 80375**

Wright, R. H.

PREDICTING OLFACTORY QUALITY FROM FAR INFRARED SPECTRA. *Ann. N. Y. Acad. Sci., vol. 237:129-136, 1974. 15 refs.*

Experiments involving the use of far infrared spectra to predict olfactory quality are reported. A comparison of the far infrared absorption spectra of two isomers, one a powerful attractant for the Mediterranean fruit fly and the other not attractive, with a generalized spectrum based on 67 known attractants for this insect reveals a close correlation between biological activity and several favorable frequencies. Morever, the same correlation holds for chemically and stereochemically different compounds which also attract this insect. Similar results are reported for various other odorants and insects.

56484 **APTIC NO. 79869**

Yanysheva, N. Y. and N. V. Balenko

THE EFFECT OF BENZ(A)PYRENE DOSE ON THE HISTOLOGIC STRUCTURE OF EXPERIMENTAL LUNG CANCER. *(O vliyanii dozy benz(a)pirena na gistologicheskuyu strukturu eksperimental nogo raka legkikh). Text in Russian. Gigiena i Sanit., no. 8:14-17, 1974.*

Malignant neoplasms of the lung were obtained as a result of intratracheal administration to albino rats of various doses of benzo(a)pyrene. The malignant tumors of epithelial origin consiste mainly of histologic types of lung cancer, similar to those that ar found in human pathology. Benzo(a)pyrene was found to affect the histologic structure of cancer: a decrease of carcinogen dosage wa followed by a decrease in the incidence of squamous epithelial lung carcinoma and a tendency toward the development of tumors of the glandular structure. (Author abstract)

56485 **APTIC NO. 73337**

Osaka Prefectural Government (Japan), Office of Environmental Pollution Control, Environmental Pollution Monitoring Center

URGENT OVERALL INVESTIGATION ON THE PHOTOCHEMICAL SMOG. (I) URGENT OVERALL INVESTIGATION ON THE AIR POLLUTION SUPPOSED TO HAVE BEEN CAUSED BY PHOTOCHEMICAL SMOG WHICH BROKE OUT AT THE SOUTHERN PART OF OSAKA ON AUG. 27TH AND SEPT. 2ND, 1971. *(Showa 46 nen 8 gatsu 27 nichi oyobi 9 gatsu 2 ka Osaka nanbu chiiki ni hassei shita kokagaku sumogu ni yoruto kangae rareru taiki osen ni kansuru kinkyu sogo chosa, Showa 46 nendo). Text in Japanese. Kokagaku sumogu ni Kansuru Chosakenkyu (Res. Rep. Photochem. Smog), vol. 1:8-117, 1974.*

On Aug. 27 and Sept. 2, 1971, incidents of photochemical smog affliction occurred among groups of students at school. An emergency investigation was conducted in search for the cause of these two incidents. The events of Aug. 27 and Sept. 2, issuance of photochemical smog warnings and activity of students afflicted are described. Symptoms complained of (eye irritation and respiratory difficulty), clinical findings, and pathological test results are given. The data on oxidant concentration measured 4.5 km from the area afflicted (maximum 1-hour value 0.18 ppm, maximum instantaneous value 0.24 ppm), nitrogen oxides, hydrocarbons, and sulfur oxides and data on wind direction, wind velocity, and weather were compiled and analyzed. The effect on plants was investigated; however, no definite correlation was found and damages to plants were presumably caused by other factors such as meteorological conditions.

56486 **APTIC NO. 73351**

Osaka Pref. Gov., Life Environmental Pollution Control Div.

PHOTOCHEMICAL SMOG INVESTIGATION AT FUJIIDERA AREA, OSAKA. *(Fujiidera chiku ni okeru kokagaku sumogu ni kansuru chosa). Text in Japanese. Kokagaku Sumogu ni Kansuru Chosakenkyu (Res. Rep. Photochem. Smog), vol. 1:118-215, 1974.*

Fujiidera city is 8.2 sq km in area and is a rural city with no major industries. The number of people who registered affliction by photochemical smog was markedly high, reaching 80% of the total complaints registered in Osaka Prefecture as of May 1972. To investigate causes for such a high local concentration in photochemical smog affliction surveys on environmental conditions, epidemiological aspects, effects on plants, and emission sources were conducted during the period of May to June 1972. Concentrations of ozone (maximum one-hour value 17 pphm), hydrocarbons (2.8 ppm), nitrogen dioxide (9 pphm), nitric oxide (22 pphm), sulfur dioxide (12 pphm), and aldehyde (3.4 pphm), wind velocity, wind direction, temperature, and humidity were measured and results were analyzed. No conclusive correlation was found between O3 concentration and number of children afflicted. No damages to plants definitely attributable to photochemical smog were found. Emission source surveys revealed that the pollutant emission from any industrial source and automobile were not particularly high. No specific causes for such a localized affliction were found.

56487 **APTIC NO. 73404**

Musashino Municipal Office (Japan), Div. of Civil Administration, Section of Environmental Pollution and Traffic

ENVIRONMENTAL POLLUTION FROM AUTOMOBILES. *(Jidosha kogai). Text in Japanese. In: Musashinoshi No Kogai, 48-Nendo (Environmental Pollution in Musashino City, 1973), p. 43-64, 1974.*

Two surveys on the presence of carbon monoxide, with concomitant measurements of traffic conditions, wind direction and velocity, and weather were conducted at 9 intersections in

Musashino City, Japan, to determine the extent of automotive pollution. The first survey was taken in June 1973; the second survey, in March-April 1974. Usual results were found. A table of CO emissions (0.2-4.0 ppm) from automobiles used by municipal government agencies is included. Since 1970, annual physical examinations have been conducted on persons living near roads with heavy automobile traffic. In 1973, 175 persons over 18 (52 males, 123 females) were examined, of whom 73 had been examined in 1972. About half of those examined (most in the 40 s and 50 s) had symptoms of high blood pressure, obesity, and anemia. There were 16 persons with respiratory tract illnesses, but of these, more than half lived in the city for less than 10 years. Consequently, no definite relationships could be ascertained between atmospheric pollution and disease.

56488 **APTIC NO. 73576**

National Academy of Sciences-National Research Council, Washington, D. C., Committee on Biological Effects of Atmospheric Pollutants

CHROMIUM. *164p., 1974. 373 refs.*

The distribution, uptake, and safety of chromium are discussed. The concentration of Cr in the ambient air of large industrial cities of the United States usually ranges from 0.01 to 0.03 micrograms/cu m and in nonurban areas is less than 0.01 micrograms/cu m. Chromium in the ambient air comes from natural sources, industrial and product uses, and the burning of coal and wood. The total Cr intake/day by man was estimated at 0.04-0.08 micrograms in air. The toxic symptoms as a consequence of excessive dietary intake of Cr and harmful effects from Cr in the ambient air are not known. Present data are not adequate for the establishment of any standards for ambient-air concentrations or emissions. No harmful effects of Cr in the ambient air have been reported. The data available from industry are limited and not applicable to air pollution situations. No data are available to determine the safe concentration of Cr in industrial exposures for prevention of lung cancer. An exposure of 0.1 micrograms/cu m for chromic acid or chromates is the generally accepted limit in the United States and other countries for prevention of ulceration and perforation of the nasal septum in occupational exposures of 8 hr/day.

56489 **APTIC NO. 79946**

Div. of Environmental Pollution Control, Funabashi City Office

RESULTS OF MORBIDITY OF RESPIRATORY DISEASES IN FUNABASHI CITY. *(Funabashi-shi ni okeru kokyuki shojo yushoritsu chosa). Text in Japanese. In: Report of Survey on Environmental Pollution in Funabashi City, p. 19, 1974.*

A survey of the morbidity of respiratory diseases of adult resident of Funabashi has been carried out yearly since 1972. The present report concerns 1973, in the Kaijin area where air pollution has been high, with a 5-year average for SO2 of 1.0 mg/100 sq cm (by PbO2 method). The subjects were 211 male and 244 female residents living in the city more than 3 years, between age 40 and 59. Lung function, blood pressure, body height and weight, sugar in urine, and chest roentgenography were examined.

56490 **APTIC NO. 79947**

Div. of Environmental Pollution Control, Funabashi City Office

RESULTS OF SURVEY ON INFANTILE AIRWAY DISEASES IN FUNABASHI CITY. *(Funabashi-shi ni okeru gakudo no kido shikkanchosa). Text in Japanese. In: Report of Survey on Environmental Pollution in Funabashi City, p. 18, 1974.*

A survey of airway diseases was carried out on 6000 primary schoolchildren in 5 schools in Funabashi City. By inquiry, 473 children with asthma and asthmatic tendencies were screened out, an 234 of them were medically examined. The number of truly asthmatic children was 150 (2.5%), same as in other air polluted cities. The disease was most common in the first grade decreasing in higher age groups. The age of onset was 2-3 years. It will be difficult to identify the local differences and age differences for the morbidit of asthma until standards of diagnosis are established.

1973

56491 **APTIC NO. 80624**

Balchum, Oscar J.

TOXICOLOGICAL EFFECTS OF OZONE, OXIDANT, AND HYDROCARBONS. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 489-505. 56 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Experimental exposures of animals and man to ozone, oxidants, and hydrocarbons are discussed. Hydrocarbons have direct physiological effects upon animals and man only at concentrations far exceeding those occurring in urban air. However, their presence in urban air is important since they react with nitrogen dioxide in the presence of sunlight to form ozone. Certain aliphatic hydrocarbons may have biological and physiological effects at concentrations of from 5000 to 10,000 ppm. Concentrations above 100 ppm of benzene, toluene, and xylene in acute and chronic exposures may result in fatigue, weakness, confusion, skin paresthesias, and mucous membrane irritation of the eyes and nose. The toxicity of aldehydes, which are formed from hydrocarbons in oxidizing atmospheres, is related to their irritant properties. Their principal effects in low concentrations are irritation of the mucous membranes of the eyes, nasopharynx, and skin. Ozone results in sensory irritation and inflammation of the airways and alveoli of the lungs, and reacts with cell membrane and lung tissue components. Whether the morphological and cellular alterations are completely reversible after periodic, frequent exposures is not known. (Author abstract modified)

56492 **APTIC NO. 80384**

Bartlett, Donald, Jr.

EFFECTS OF CARBON MONOXIDE ON HUMAN PHYSIOLOGICAL PROCESSES. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 103-126. 35 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Effects of carbon monoxide on human physiological processes that may be brought about by exposure to relatively low concentrations are discussed. The most important mechanisms by which CO influences vital processes are described, and current knowledge about the extent to which these mechanisms may influence human health and well being is reviewed. The impairment of oxygen delivery by CO is a continuum. There is no evidence for a threshold CO concentration below which there are no effects.

56493 **APTIC NO. 80623**

Bates, David V. and Milan Hazucha

THE SHORT-TERM EFFECTS OF OZONE ON THE HUMAN LUNG. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 507-540. 15 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Data relating to the effects of human exposure to ozone are reviewed. Two cases of accidental exposure to high ozone concentrations are included. The probable level of exposure in the first case is not known, but diffuse pneumonitis persisted for 6 days. The exposure in the second case was between two and 11 parts per million, and the individual was asymptomatic after 48 hr. Controlled ozone exposures indicate that 0.37 parts per million ozone for 2 hr with intermittent exercise measurably affects pulmonary function in normal subjects. Pulmonary function returns to normal in 2 to 3 hr. If the same concentration of sulfur dioxide is present, greater airway irritation occurs earlier. Considerations for determining an upper limit on urban ozone concentration are discussed. The Canadian maximal 1 hr level of photochemical oxidants, 0.08 parts per million, is realistic. Sudden respiratory symptoms resulting from 0.1 to 0.35 parts per million SO2 and ozone estimated above 0.3 parts per million are reported.

56494 **APTIC NO. 80625**

Carroll, Robert E.

EPIDEMIOLOGIC STUDIES OF OXIDANT AND HYDROCARBON AIR POLLUTION. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973. p. 541-555. 28 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

The existing epidemiologic evidence of an oxidant and hydrocarbon effect on human health is reviewed. Other than eye irritation, only a decrement in maximal effect athletic ability has been unambiguously demonstrated. One study reported that a very small portion of asthmatics may have nonsevere attacks precipitated at relatively high levels of oxidant. Suggestions have been made of effects on pulmonary function and aggravation of existing respiratory disease, but the results are not consistent. Several studies indicate no effect or a very minimal one on mortality rates, serious illness production and hospitalization, and lung cancer causation. Few chronic effects were found. This lack of evidence does not mean that effects do not exist. Many of these studies are poorly designed or the papers do not mention important variables. (Author abstract modified)

56495 **APTIC NO. 80819**

Chandra, Satya V., Z. Imam, and Neeti Nagar

SIGNIFICANCE OF SERUM CALCIUM, INORGANIC PHOSPHATES AND ALKALINE PHOSPHATASE IN EXPERIMENTAL MANGANESE TOXICITY. *Ind. Health (Japan), 11(1 and 2):43-47, 1973. 13 refs.*

Male rabbits were injected intratracheally with 400 mg/kg of manganese dioxide dust (particle size below 5 micron) to investigate the significance of serum calcium, inorganic phosphates, and alkaline phosphatase as biological indicators of manganese toxicity. The serum calcium level after 180 days showed a significant increase (9.33 mg/100 ml for manganese-treated animals versus 7.43 mg/100 ml for controls); whereas the level of inorganic phosphates showed a significant decrease after the same period (3.68 mg/100 ml in treated animals versus 4.83 mg/100 ml in controls). Alkaline phosphatase levels were decreased from a control level of 6.56 K.A. units to 2.13 K. A. units after 180 days. No gross or microscopic abnormalities were observed in either the parathyroids or bones of the experimental animals. The kidneys of experimental animals, however, were swollen and congested after 60 days. The biochemical alterations observed in manganese-treated animals occurred at a much earlier stage than the development of symptoms of manganese encephalopathy, suggesting their usefulness as indicators of manganese toxicity.

56496 **APTIC NO. 73610**

Courtney, K. Diane, M. F. Copeland, and A. Robbins

THE EFFECTS OF PENTACHLORONITROBENZENE, HEXACHLOROBENZENE AND RELATED COMPOUNDS ON FETAL DEVELOPMENT. *Preprint, Toxicology Society, Richmond, Va., 36p., 1973. 20 refs. (Presented at the Toxicology Society, Annual Meeting, 12th, New York, March 18-22, 1973.)*

The effects of fungicide pentachloronitrobenzene and related compounds on the fetal development of laboratory mice and rats were investigated. Pentachloronitrobenzene which contained a number of contaminants was teratogenic in C57B1/6 mice, resulting in the production of renal agenesis and cleft palate. Cleft palates were also produced in CD-1 mice by PCNB. The major contaminant was hexachlorobenzene which produced cleft palates and some kidney malformations in CD-1 mice. Tetrachloronitrobenzene, a contaminant of PCNB, and pentachloroaniline, a metabolite of PCNB, were not teratogenic in mice or rats. Pentachlorophenol was not teratogenic in rats. Neither PCNB nor pentachlorobenzene accumulated in the tissues of pregnant mice in contrast to hexachlorobenzene which accumulated in a number of tissues such as fat, urinary bladder tissue, skin, and thymus tissue. (Author abstract modified)

56497 **APTIC NO. 80626**

Epstein, Samuel S.

MUTAGENICITY ASSOCIATED WITH AIR POLLUTANTS. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 585-602. 55 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Potential biological hazards due to environmental contaminants extend to chronic toxic effects including mutagenesis. There is generally an inverse relation between the severity of the gene effect and the number of persons that will be exposed to this effect. Dominant lethal assays and host mediated assays are discussed. Epidemiologic data should be collected. Certain fractions of organic extracts of particulate atmospheric pollutants contain poorly defined radiomimetic compounds, which are generally both carcinogenic and mutagenic. Various expert committees in other fields have recently recommended that mutagenicity testing be included with toxicological testing, but such considerations do not appear to have yet been extended to proposed standards for oxides of nitrogen as atmospheric pollutants.

56498 **APTIC NO. 80383**

Frank, R. C., C. E. McJilton, and R. J. Charlson

SULFUR OXIDES AND PARTICLES; EFFECTS ON PULMONARY PHYSIOLOGY IN MAN AND ANIMALS. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 207-225. 24 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Sulfur dioxide alone in concentrations typical of urban communities presents only a slight hazard to the lungs. The effects of a mixture of SO2 and sodium chloride aerosol on guinea pigs were studied experimentally. When SO2 combines with a submicronic wet aerosol, the hazard may increase significantly. The factors influencing this interaction include temperature and catalytic agents. Young male subjects in another experiment were exposed to 1 ppm SO2 for 6 hr. Notwithstanding the capacity of the nose to remove SO2 from the inspired air, there was a reduction in forced expiratory flow rate over the middle range of the vital capacity. (Author abstract modified)

56499 **APTIC NO. 76129**

Gladkova, Y. V., F. P. Odintsova, I. D. Bolkova, and V. K. Vinogradova

HEALTH CONDITIONS OF WORKERS ENGAGED IN THE PRODUCTION OF A PLATINUM CATALYTIC AGENT. *(O sostoyanii zdoroy ya rabochikh proizvodstva platinovogo katalizatora). 4p., 1973. 7 refs. Translated from Russian, 8p.*

A study of the health of workers producing platinum catalysts is presented. Fifty-two workers from 20 to 54 years of age were examined. The workers were subjected to vapors of sulfuric, nitric, and acetic acids, hydrogen sulfide, aluminum oxide dust, the prepared product, and especially chloroplatinic acid. Chloroplatinic acid had an allergic effect of the respiratory tract, eyes, and skin. It also produced a type of allergic rhinitis, bronchitis, bronchial asthma, conjunctivitis, rashes, and dermatitis. Allergic changes of the respiratory tract, eyes, and skin in workers producing platinum catalysts can be considered an occupational health problem. It is recommended that workers producing platinum catalysts be required to undergo medical examinations. (Author abstract modified)

56500 **APTIC NO. 79871**

Grosser, P.-J., C. Stark, B. Kolbe, K. Stieg, and H. Mehlhorn

VITAL CAPACITY AND FORCED EXPIRATORY VOLUME IN SCHOOLCHILDREN OF TH 1ST, 5TH, AND 9TH GRADES IN REGIONS WITH VARIOUS AIR POLLUTIONS (STUDIES IN HALLE AND SCHWERIN). *(Vitalkapazitaet und Atemstosstest bei Schulkindern der 1., 5. und 9. Klasse in lufthygienisch unterschiedlich belasteten Gebieten. (Untersuchunge in den Staedten Halle und Schwerin)). Text in German. Z. Erkrankungen Atmungsorgane, vol. 138:321-338, 1973. 19 refs.*

Anthropometric indices, the vital capacity, and the forced expiratory volume were determined in 725 schoolchildren of the 1st, 5th, and 9th grades in Halle, a highly industrialized city with hig air pollution levels in East Germany, and in 665 children of the same grades in Schwerin, a smaller town of rural charact·‧, and wit considerably lower air pollution levels. The values obtained for the vital capacity and forced expiratory volume were usually more favorable in the children living in Schwerin than in those living i Halle. The difference could be partly secured statistically. This difference is attributed to the significantly higher air pollution level in this city. Certain anthropometric indices, such as height body weight, and the diameter of the thorax, were usually smaller i the children living in Halle.

56501 **APTIC NO. 73524**

Klizek, Ronald

THE EFFECTS OF SULFUR DIOXIDE ON THE RESPIRATORY CAPABILITIES OF THE LABORATORY RAT. *Preprint, Niagara Univ., Niagara University, N. Y., 40p., Aug. 24, 1973. 16 refs.*

Sprague Dawley rats (18 experimentals and 18 controls) were exposed to a mean sulfur dioxide concentration of 5.24 ppm for a 7-week period to investigate the effect of the gas on blood gas and pH values, red blood cell count, hemoglobin concentration, and packed cell volume. No changes in any of these values were observed upon subjecting the data to statistical analysis. Similar experiments of longer exposure duration and with animals more susceptible to toxic gases are recommended as a follow-up to the present experiment.

56502 **APTIC NO. 80627**

Kotin, Paul

MUTAGENIC AND CARCINOGENIC PROBLEMS ASSOCIATED WITH AIR POLLUTANTS. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973. p. 603-617. 12 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

There is substantial evidence that polluted community air (PCA) contributes to an increased risk of cancer, particularly of the lung, whereas the data suggesting a mutagenic effect are nonexistant. Criteria for verifying a carcinogenic hazard are discussed, and carcinogenic agents identified in PCA are listed. A class of compounds recognized as radiomimetic has been identified in PCA. Potential mutagenic hazards are listed. As with chemical carcinogens, these agents occur in PCA in low concentrations, and exposure to them may occur for significant segments of the life span of urban residents. Reduction or elimination of carcinogenic agents from PCA should indeed result in a reduction of the urban risk to lung cancer. It would not necessarily be very significant in the face of the persistence of other pulmonary carcinogen sources. Control of vehicular exhaust, industrial effluents, heating and incineration products, and chemical agents distributed as aerosols or broadcast as dusts would immediately reduce the concentration of carcinogenic agents in PCA. Predictions as to the extent of reduction when only one of the factors is eliminated are of questionable meaning in the light of the multiplicity of factors described.

56503 **APTIC NO. 80828**

Sellakumar, Arthur R., Ruggero Montesano, Umberto Saffiotti, and David G. Kaufman

HAMSTER RESPIRATORY CARCINOGENESIS INDUCED BY BENZO(A)PYRENE AND DIFFERENT DOSE LEVELS OF FERRIC OXIDE. *J. Nat. Cancer Inst., 50(2):507-510, Feb. 1973. 16 refs.*

Dose-response relationships for respiratory carcinogenesis in Syrian golden hamsters were studied by administering iron oxide in doses of 3, 6, and 9 mg to different groups of animals, all receiving 3 mg of benzo(3-4)pyrene. Squamous cell carcinomas were the predominant morphologic type of induced tumors, with the bronchi being the most frequently affected. Essentially identical results were observed for each of the dosages tested. Doses of ferric oxide beyond a 1:1 ratio with benzo(3-4)pyrene did not enhance tumor yield. A constant tumor yield was thus demonstrated for a constant quantity of benzo(3-4)pyrene, regardless of the ferric oxide dose. (Author summary modified)

56504 **APTIC NO. 80619**

Shy, Carl M.

HUMAN HEALTH CONSEQUENCES OF NITROGEN DIOXIDE: A REVIEW. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Science, Health Eff. Air Pollut. Conf. Proc., 1973, p. 363-405. 56 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Because of low water solubility, nitrogen dioxide can penetrate deeply into the lung. Occupational and accidental exposures far in excess of ambient concentrations demonstrate that NO2 is acutely fatal to humans at levels of 150 ppm and above, and at concentrations between 25 and 100 ppm causes acute but reversible bronchitis, bronchiolitis, and pneumonitis. Acute NO2 exposures of humans from 1.6 to 5.0 ppm for 15 to 60 min caused increased airway resistance, increased alveolar-arterial oxygen pressure gradients, and diminished diffusion capacity of the lung. Chronic effects of NO2 on lung tissue have not been convincingly demonstrated in humans. The data affirm a relationship between NO2 exposure and impairment of resistance to human respiratory pathogens. Statistics indicate the possibility of a relationship between NO2 exposure and hypertension and lung cancer. Acute toxic reactions, diminished lung function, structural and biochemical changes of lung most likely to promote development of chronic respiratory disease, susceptibility to infection, and systemic effects have been associated with NO2. The primary national standard for NO2 should be reasonably protective of public health.

56505 **APTIC NO. 73578**

National Academy of Sciences - National Academy of Engineering, Washington, D. C., Panel on Vanadium

VANADIUM. *Preprint, 178p., 1973. 219 refs.*

A review of the occurrence and toxicological effects of vanadium is presented. Vanadium occurs ubiquitously in the earth s crust and is present at a concentration of about 150 ppm. The largest anthropogenic contribution to atmospheric pollution by V is from the combustion of fossil fuels. Estimates of the contribution of V to the atmosphere in 1968 from coal combustion range from 1750-3760 tons, and estimates of its contribution from the combustion of residual fuels range from 12,400 to 19,000 tons in 1969 and 14,000 to 22,000 tons in 1970. The increased demand for low-sulfur fuels is expected to significantly reduce such V emissions since the V content is reduced during desulfurization. Airborne V concentrations range between 0.1 ng/cu m to about 1 microgram/cu m. Although V is an essential element for chicks and rats at least, in higher concentrations the metal is toxic to animals. Vanadium s principle toxic effects in man (at concentrations of several mg/cu m) include direct irritation of the tracheobronchial tree along with cough, sputum, tightness in the chest, wheezing, and eye, nose, and throat irritation. Weakness, neurasthenia, and slight anemia also sometimes occur. With the anticipated V reductions in residual fuel oils, controls for ambient atmospheres are not expected to be necessary. Improved fume and dust collection at localized industrial emitters may be necessary if environmental V concentrations are found to be significantly increased. (Author summary modified)

1972

56506 **APTIC NO. 80693**

Emmerich, H., S. W. Bender, R. H. Jaklin, and W. Emmerich

THE EFFECT OF ATMOSPHERIC SULFUR DIOXIDE ON CROUP SYNDROME. COMPUTER ANALYSIS. *Z. Kinderheilk., 113(2):111-121, 1972. 22 refs.*

A computer analysis of the possible relationship between the occurrence of croup syndrome in 576 children (mainly infants) and sulfur dioxide and dust concentrations was performed for the period 1967-1971. Croup incidence increased with increasing dust concentrations, as was expected from earlier studies. However, sulfur dioxide concentration appeared to be an additional factor affecting morbidity. Accumulative correlations in monthly and weekly intervals showed a definite increase in croup cases with increasing SO2 levels. Sulfur dioxide concentrations higher than 80 ppb appeared to definitely promote the onset of croup. The relationship was even more evident for 3-hour mean SO2 values, suggesting that one high 3-hour maximum stress per day exerted a greater influence on morbidity than continuous lower daily averages.

56507 **APTIC NO. 80793**

Freeman, G., S. C. Crane, N. J. Furiosi, R. J. Stephens, M. J. Evans, and W. D. Moore

COVERT REDUCTION IN VENTILATORY SURFACE IN RATS DURING PROLONGED EXPOSURE TO SUBACUTE NITROGEN DIOXIDE. *Am. Rev. Respirat. Disease, 106(4):563-579, Oct. 1972. 41 refs.*

Rats were exposed continuously for a natural lifetime, except for periods of respite, to approximately 15 ppm of nitrogen dioxide, a concentration that did not induce edema, hemorrhage or inflammation. The aged, sacrificed animals had voluminous, dry lungs with a large functional residual capacity. The lung volume was greater than that in control animals at maximal standard pressure. Terminal bronchioles and alveolar ducts exhibited loss of cilia, epithelial hypertrophy, and narrowing. Alveoli were distended with attenuation of walls in the periphery and hypertrophy of epithelium in central alveoli. Exposed animals had approximately one third the number of alveoli of control animals, and the ventilatory surface area was reduced accordingly. Arterial oxygen tension was reduced in the advanced state of disease, and secondary polycythemia was apparent. The disease resembled emphysema in humans. (Author abstract)

56508 **APTIC NO. 80836**

McCarthy, D. S. and D. B. Craig

WHY THE DIFFERENCE IN CLOSING VOLUME? *Lancet, 1972:1321, Dec. 16, 1972.*

The use of closing volume measurements for the early detection of lung disease is discussed, with particular reference to regional differences observed among asymptomatic smokers. About 15% of 91 asymptomatic female smokers living in Winnipeg, Manitoba showed abnormalities in closing volume traces in contrast to previous studies which showed closing volume abnormalities in 72% of 46 male asymptomatic smokers living in London, England. The regression line for non-smoking females in Winnipge was similar to that observed for non-smoking males in London. The regional difference is hypothesized as being due to atmospheric pollution which is high in London and very low in Winnipeg and probably acts synergistically to accentuate the detrimental effect of tobacco smoke on the lungs.

56509 **APTIC NO. 80835**

Pinkerton, Henry

EFFECTS OF ADJUVANTS ON BENZPYRENE TUMORIGENESIS IN HAMSTERS. *Proc. Soc. Exp. Biol. Med., 141(3):1089-1091, Dec. 1972. 3 refs.*

The effects of three different adjuvants on the development of benzo(a)pyrene-induced tumor development in hamsters were studied. Prior treatment of adult pregnant or non-pregnant female hamsters with the adjuvants appeared to suppress tumor development, whereas prior treatment of pregnant females greatly enhanced the development of tumors in their progeny. The average tumor weight in maternally treated progeny was 1.8-3.8 times as great as that of the control progeny. The direct effect of two of the adjuvants tested was inhibition of benzo(3-4)pyrene tumorigenesis.

56510 **APTIC NO. 76130**

Vysamyae, A. I.

EXPERIMENTAL RESEARCH ON CLARIFYING CARCINOGENEITY OF SHALE OIL SOOT. *(Eksperimental nyye issledovaniya po vyyasneniya kantserogennosti slantsevoy sazhi). Nauchno-Pracht. Deyat. Inst. Eksp. Klin. Med. Tallin, vol. 1972:115-124, 1972. 13 refs. Translated from Russian, 15p.*

Experiments done between 1955 and 1960 established that benzene extract of the soot of shale solid fuel and extract from fuel oil will induce skin tumors and skin cancer when applied to the skin of mice. The carcinogenic activity of soot increased as the content of 3,4-benzpyrene increased. Tests between 1960 and 1962 found singificant incidence of preblastomogenic changes (mostly focal proliferates) in the lungs of rats that inhaled dust containing 3,4-benzpyrene; one rat developed a malignant epidermal cyst. Tests that combined exposure to the soot of shale fuel and to the benzene extract of tarry substances manufactured from it with exposure to other agents known to cause lung tumors were performed between 1960 and 1962. Intratracheal introduction of shale root or tarry substances with peroral introduction of urethane did not significantly increase the incidence of lung tumors in rats, beyond the results expected for urethane alone. Between 1963 and 1965, tarry substances from the soot of shale from solid fuel (with 3,4-benzpyrene content in the soot of 0.0107%) were introduced in rats intractracheally in 2 different suspension media: one a a solution of Tween 40 solvent, the other peach oil. Some rats from each group were subjected to irradiation with X-rays. The tumor-response of the lungs depended only on the character of the suspension medium. Bronchial type epidermoid blastomata were found only in rats that received tarry substance in the suspension of Tween 40. Thus, tests support the possibility of developing lung tumors due to the effect of tarry substances from the soot of fuel shales, that is, from a carcinogenic substance weak in content of 3,4-benzopyrene. The role of the character of the suspension medium in laboratory inducement of lung tumors was also clarified.

EFFECTS-PLANTS AND LIVESTOCK

1969

56511 **APTIC NO. 80066**

Smyth, Henry F., Jr., Charles P. Carpenter, Carrol S. Weil, Urbano C. Pozzani, Jean A. Striegel, and Judith S. Nycum

RANGE-FINDING TOXICITY DATA: LIST VII. *Am. Ind. Hyg. Assoc. J., vol. 30:470-476, Sept.-Oct. 1969. 6 refs.*

Acute toxicity and irritation data for about 200 commercial compounds are presented. The data include mortality figures for rats subjected to concentrated vapor inhalation and inhalation of metered vapor concentrations. Classes of compounds convered include: hydrocarbons, hydroxyl compounds, ethers, hydroxy ethers, aldehydes, ketones, acids, anhydrides, lactones, esters, acetals, epoxy compounds, heterocyclic compounds, aromatic nitro compounds, amino compounds, amides, cyano compounds, halogen compounds, phosphorus compounds, and silicon compounds.

EFFECTS-PLANTS AND LIVESTOCK

1975

56512 **APTIC NO. 79922**

Beavington, F.

HEAVY METAL CONTAMINATION OF VEGETABLES AND SOIL IN DOMESTIC GARDEN AROUND A SMELTING COMLPLEX. *Environ. Pollut., 9(3):211-217, Nov. 1975. 9 refs.*

Twenty one samples of leaf vegetables were collected from 17 garden near the copper smelter in Wollongong, Australia. Twelve samples were lettuce and the rest were cabbage, garlic leaf, and mint. A soil sample was also taken at each site where vegetables were sampled. Determinations of both vegetable and soil extracts were carried out by atomic absorption spectroscopy. Levels of copper, zinc, lead, cadmium, nickel, and iron were high. Mean levels of lead, cadmium, and nickel in lettuce were 23 ppm, 4.5 ppm, and 2.7 ppm, respectively. Easily extractable levels of heavy metals in th supporting soil were also high. Significant correlations existed between distance from the main chimney of the smelter and the level of a number of the metals in both the soil and the leaf vegetables. Highly significant correlations also occur among the levels of most heavy metals in both soil and leaf vegetables. (Author abstract modified)

56513 **APTIC NO. 80748**

Croessmann, G. and W. Egels

RESEARCH CONCERNING THE CADMIUM CONTENTS IN SINGLE FOODSTUFFS. *(Untersuchungen ueber den Cadmiumgehalt in Einzelfuttermitteln). Text in German. Landwirtsch. Forsch., 28(2):164-173, 1975. 8 refs.*

Six hundred and thirty-three commercial foodstuffs were analyzed for cadmium content by the stripping polarographic method. The limit of detection was 0.01 ppm. Eighty-two of the 213 grain feed samples (38%) had detectable cadmium contents ranging from 0.01 to 0.75 ppm, averaging 0.08 ppm. Fifteen of the 46 samples of milling by-products (32%) contained 0.01-0.14 ppm of Cd, averaging 0.07 ppm. Oil cake, extracts, and different feed samples contained 0.01-3.16 ppm of Cd at an incidence of 41%. Fifty-five of the 93 samples of animal protein products (59%) contained 0.01-3.99 ppm of Cd, averaging 0.46 ppm. In all, 32% of all foodstuffs of vegetable origin contained Cd in a range of 0.01-3.16 ppm, with an average of 0.14 ppm, against 53% of all foodstuffs of animal origin, ranging from 0.01 to 3.99 ppm, with an average of 0.46 ppm. Industrial emissions, emissions during the combustion of coal and oil, contamination during foodstuff processing, and mineral fertilization are regarded as the chief sources of environmental contamination with Cd.

56514 **APTIC NO. 80536**

Diouris, M. and M. Penot

EFFECT OF SODIUM FLUORIDE ON THE PHOSPHATE ABSORPTION BY POTATO TUBER TISSUE - INFLUENCE OF CALCIUM. *Fluoride, 8(4):208-223, Oct. 1975. 36 refs.*

Phosphate uptake by disks of potato tubers aged for 24 hr in 0.5 mM calcium chloride was studied after pretreatment for 15 min in 0.05 M sodium fluoride. The disks aged in the $CaCl_2$ solution showed an increase in phosphate uptake only when they were pretreated with NaF. This phenomenon was no longer observed when the calcium was eliminated by the action of ethylene diamine tetraacetic acid. Absorption of calcium and fluoride by the potato disks was essentially a nonmetabolic process. Disks aged in a calcium solution fixed more fluoride then fresh disks, but the subsequent increase in uptake of phosphate was not directly related to the increased fixation of fluoride. The rise in phosphate absorption by disks treated with NaF was not a metabolic process, because it occurred when all experiments were conducted at O C. The increased phosphate uptake was largely localized at the physicochemical level in the membrane.

56515 **APTIC NO. 79921**

Dochinger, Leon S. and Keith F. Jensen

EFFECTS OF CHRONIC AND ACUTE EXPOSURE TO SULPHUR DIOXIDE ON THE GROWTH OF HYBRID POPLAR CUTTINGS. *Environ. Pollut., 9(3):219-229, Nov. 1975. 5 refs.*

Hybrid poplar clones were fumigated in controlled environment chambers with either 5 ppm sulfur dioxide for 1.5, 3, and 6 hours or with 0.25 ppm sulfur dioxide for 6 weeks. Multivariate analyses were made from shoot growth data before and after treatment and on the foliar injury induced by SO_2. Short and long term fumigation produced similar responses to the two SO_2 concentrations. (Author abstract)

56516 **APTIC NO. 80711**

Groth, E., III

AN EVALUATION OF THE POTENTIAL FOR ECOLOGICAL DAMAGE BY CHRONIC LOW-LEVEL ENVIRONMENTAL POLLUTION BY FLUORIDE. *Fluoride, 8(4):224-240, Oct. 1975. 74 refs. (Presented at the International Society for Fluoride Research Conference, 6th, Nov. 7-9, 1974.)*

The potential for ecological damage by chronic low-level environmental pollution by fluoride was evaluated. A wide range of organisms can accumulate substantial concentrations of fluoride from the air, water, or soil. Estimates of fluoride air pollution range from 120,000 to 155,000 ton/yr for the United States. Except in the immediate vicinity of a source, fluoride levels in air are generally quite low, below 1 ppb. Concentrations below 1 ppb are biologically significant and can occur over widespread areas when pollution is present. These levels of exposure are capable of causing some adverse impact in wildlife species. The effects of fluoride pollution on wildlife organisms are summarized. It is possible that fluoride is transformed by some organisms in the natural environment into far more toxic organic fluorides.

56517 **APTIC NO. 73259**

Gruen, Wolfgang

TRASH COMPOST AND NUTRIENT SUBSTANCE FOR VEGETATION ALONG BUILDING FRONTS AND ON ROOFS. *(Muellkompost und Naehrsubstrat fuer Gruen an Fassaden und auf Daechern). Text in German. Bau-Intern/Wasser/Abwasser, no. 1/2:31-36: 1975. 5 refs.*

The advantages of ivy, vines, grass, and other vegetation on building fronts and on roofs are described. Vegetation on buildings would be especially important in urban and industrial agglomerations where every free spot should be spared for nature. Vegetation, either in gardens or on buildings, acts as an efficient filter for particulate and gaseous air pollutants, as it absorbs carbon dioxide and nitrogen oxides, and produces oxygen. In addition, vegetation on buildings protects the construction materials, and improves heat insulation.

56518 **APTIC NO. 73513**

Hass, Bruce S. and Howard G. Applegate

THE EFFECTS OF UNSUBSTITUTED POLYCYCLIC AROMATIC HYDROCARBONS ON THE GROWTH OF ESCHERICHIA COLI. *Chem.-Biol. Interactions (Amsterdam), vol. 10:265-268, 1975. 7 refs.*

The effect of three-, four-, and five-ring unsubstituted polycyclic aromatic hydrocarbons on the growth of Escherichia coli bacteria was determined at concentrations ranging from 10 to the -7th M to 0.00001 M. The angular hydrocarbon configurations of 1,2-benzanthracene, 1,2,5,6-dibenzanthracene, and 3,4-benzpyrene promoted growth, while anthracene, phenanthrene chrysene, 1,2,3,4-dibenzanthracene, and pentacene inhibited growth at most concentrations. Tetracene and pyrene showed little or no effect on bacterial growth. Although no universal pattern of concentration effect was evident, growth promotion appeared to require an angular acene molecule configuration in contrast to growth inhibition which can occur with straight as well as angular acene compounds. (Author abstract modified)

56519 **APTIC NO. 80957**

Hawksworth, D. L.

LITERATURE ON AIR POLLUTION AND LICHENS III. *Lichenologist, vol. 7:173-177, 1975. 55 refs.*

An annotated bibliography of 55 sources dealing with air pollution and lichens is presented. The subject matter includes: laboratory and field studies, mapping of lichen zones, pollution from particulate industries, such as pulp and metallurgical processes, and the toxicity of specific pollutants such as sulfur, aluminum, magnesium, and cadmium.

56520 **APTIC NO. 73514**

Hofstra, G. and G. P. Lumis

LEVELS OF DEICING SALT PRODUCING INJURY ON APPLE TREES. *Can. J. Plant Sci. (Ottawa), vol. 55:113-115, Jan. 1975. 5 refs.*

Winesap apple trees were sprayed with various concentrations of aqueous sodium chloride to investigate the effect of highway salt on roadside trees. A suppression of flowering and dieback of terminal shoots was associated with increased levels of sodium and chloride in twigs, and these effects were observed on trees sprayed experimentally with 2% aqueous solutions of road salt and roadside trees exposed to salt spray. Concentrations of Na and Cl exceeding 0.20 and 0.50% (dry weight), respectively, were associated with tree injury. (Author abstract modified)

56521 **APTIC NO. 79872**

Impens, R., J. Deroanne-Bauvin, and J. Billiau

ENVIRONMENTAL LEAD CONTAMINATION NEAR HIGHWAYS. *(La contamination plombique de l environnement a proximite des autoroutes). Text in French. Ann. Gembloux, no. 79:85-96, 1975. 16 refs.*

Results of lead concentration measurements in indicator plants, grass, fruits, vegetables, and in soil samples along major highways in Belgium are presented. The lead content in indicator plants growing along the highways was a direct function of the traffic density, and it was inversely related to the precipitation. The lead concentrations determined in grass exceeded the maximum admissible level of 10 ppm in all but 3 of 200 samples. Lead level of up to 1135 ppm were measured in grass, and hay contained 4 to 5 times more lead than is admissible. Soil samples taken at distance of up to 100 m contained 25 to 788 ppm of lead. Fruits and vegetables grown near the highways often contained lead levels over 10 ppm.

56522 **APTIC NO. 79957**

Kameyama, A.

EFFECTS OF MOTOR ROADS ON VEGETATION AROUND THE ROADS PART 3. *(Shado ni yoru shuken shokusei eno eikyo (III)). Text in Japanese. Shinshu Daigaku Nogaku-bu Kiyo (J. Fac. Agric. Shinshu Univ.), 12(1):1-18, June 1975. 28 refs.*

In Kasugayama, a primeval mountain forest (497 m elevation) located in the eastern part of Nara City, in which vegetation has been strictly preserved, a motor road 4 - 5 m in width was constructed for sight seeing in 1930 under strict limitation of traffic conditions. A survey of the effects of auto exhaust of the road on the vegetation was carried out in 29.1 ha along 1.5 km of the road. A survey of the plant community was taken and a vegetation map made According to the vegetation map, motor traffic affected a zone of 10 - 20 m, frequently attaining 50 m along the road. The plants in the zone were Callicarpa mollis, C. japonica, Carpinus tschonoskii, Akebia trifolia, Wisteria floribunda, and others.

56523 **APTIC NO. 80535**

Kay, C. E., P. C. Tourangeau, and C. C. Gordon

INDUSTRIAL FLUOROSIS IN WILD MULE AND WHITETAIL DEER FROM WESTERN MONTANA. *Fluoride, 8(4):182-191, Oct. 1975. 24 refs.*

The use of bone tissue of mules and whitetail deer as indicators of environmental fluoride pollution was evaluated from 1970-1972 in western Montana. Fluoride in vegetation was markedly higher than in control areas. Because individual deer do not live in precisely the same location every year, the exact consumption of fluoride could not be determined, but bone fluoroassays from deer inhabiting two contaminated areas showed a 5 to 50 fold greater fluoride concentration than for controls. In any particular deer, the level of fluoride was highest in the mandible, followed by the femur and the ribs, with the lowest concentration in the metacarpals or metatarsals. Cancellous, metabolically active bones accumulated more fluoride than dense compact bones. (Author summary modified)

56524 **APTIC NO. 79864**

MacLean, D. C. and R. E. Schneider

PHOTOCHEMICAL OXIDANTS IN YONKERS, NEW YORK: EFFECTS ON YIELD OF BEAN AND TOMATO. *Preprint, Boyce Thompson Inst., Yonkers, N. Y., 16p., 1975. 30 refs.*

Field plots of bean (Phaseolus vulgaris) and tomato (Lycopersicon esculentum) plants were exposed in chambers to ambient air or air from which 60-70% of the ambient photochemical oxidants were excluded for periods up to 99 days. Ozone was the principal oxidan to which the plants were exposed. During the experimental period, the air quality standard for photochemical oxidants (8 pphm) was exceeded 11% of the time in the unfiltered chambers and for only 1 hr in the filtered chambers. A comparison of exposed and relativel nonexposed plants revealed that ambient oxidants in the Yonkers, Ne York area reduced the fresh weight yield of tomato plants by at least 33%. The weight and number of marketable pods of bean plants were reduced by 26 and 24% respectively when these plants were exposed to ambient conditions. (Author abstract modified)

56525 **APTIC NO. 79936**

Nakagawa, Yoshihiro, Hidekatsu Mitsuki, and Nakaaki Takata

PLANT RESPONSE TO AIR POLLUTION BY HEAVY METALS. *Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):314, 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., 3p. (Presented at the National Conference on Air Pollution, 16th, Japan, Paper 197.)*

The effect of air pollutants on the concentration of heavy metals in leaves of trees in the neighborhood of a steel factory was studied. The source of air pollutants was investigated, along with chemical properties and components, using particles collected in a dust collector. Atmospheric samples were taken by a high volume sampler. Paulownia trees, which absorb and accumulate heavy metals better than other trees, were sampled in the middle of November. The concentration of heavy metals in the soil was measured for ever 10 cm vertically downward to a depth of 80 cm near the roots of the sample trees. The concentrations of iron and manganese in the dust were 34.6 to 57.8% and 0.41 to 3.21%, respectively, mainly in oxidized form. The amounts of these metals discharged from the factories were calculated from the concentrations in the atmosphere Trees leaves in the polluted area were analyzed to determine the route of atmosphere iron from the source to the atmosphere to the soil, where it is absorbed by the roots to accumulate in the leaves The concentration of Mn in soil exponentially decreases with distance from the source, but its concentration in tree leaves increases with distance.

56526 **APTIC NO. 80777**

Nouchi, I.

EFFECTS OF PHOTOCHEMICAL OXIDANT (OZONE AND PAN) ON PLANTS. *(Shokubutsu ni oyobosu kokagaku okishidanto (Ozone, PAN) no eikyo). Text in Japanese. Shokubutsu to Shizen (Plants and Nature), 9(5/6):12-21, 1975. 47 refs.*

The history of plant damage due to smog is reviewed, beginning with the first observation of plant damage due to photochemical smog on July 18, 1970 in Tokyo (an abnormal leaf-fall of Zelkova serrata). The different plant damage patterns due to each component of photochemical oxidant (ozone and peroxyacetyl nitrate) are described, emphasizing visible symptoms. Microscopic observation of damaged tissues distinguished the damage due to ozone and that due to PAN. Electron microscopic observation of chloroplasts in damaged leaves, and the effects of ozone and PAN on pigments, proteins, and RNA are discussed. The effects of ozone and PAN on chloroplast in vitro are also described. The mechanism of oxidant damage to leaf-tissues and cells is discussed.

56527 **APTIC NO. 81012**

Numata, M.

AIR POLLUTION AND VEGETATION. *(Taikiosen to shokusei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(2):77-85, 1975.*

Although the direct effects of each air pollutant have been fairly well studied for specific species of plants used as indicators, studies on the synecological level have not been done. Clement s communities can be used as indicators. The effects of air pollution should be studied as one in a complex of factors. The characteristic features of biological indicators are described in detail with emphasis on applying the results to human beings in polluted environments. The methods of determining the effects of pollution are described, using a community phytometer and remote sensing methods. Directly connecting the level of air pollution to the wilting of trees in general is dangerous unless it is a matter of an acute episode.

56528 **APTIC NO. 79909**

O Connor, J. A., D. G. Parbery, and W. Strauss

THE EFFECTS OF PHYTOTOXIC GASES ON NATIVE AUSTRALIAN PLANT SPECIES: PART 2. ACUTE INJURY DUE TO OZONE. *Environ. Pollut., 9(3):181-192, Nov. 1975. 13 refs.*

The relative sensitivity of 120 Australian tree and shrub species to ozone injury has been studied. Acute foliar injury occurred in three Banksia species, one Acacia, one Melaleuca, and two Eucalyptus species following a 5-hour exposure to 50 pphm of ozone in filtered air, under conditions promoting rapid uptake of the toxicant. Most of the test species were highly resistant to ozone; 73 species showed no foliar lesions after exposure to 80 pphm ozone for 6 hour. (Author abstract)

56529 **APTIC NO. 80956**

O Hare, G. P. and P. Williams

SOME EFFECTS OF SULPHUR DIOXIDE FLOW ON LICHENS. *Lichenologist, vol. 7:116-123, 1975. 20 refs.*

Three lichen species, Hypogymnia physodes, Pseudevernia furfuracea, and Usnea subfloridana collected from the Aberfoyle district of north west central Scotland were fumigated by a sulfur dioxide contaminated air stream (0.1-0.2 ppm SO2) at six different flow rates. The selected lichens were damaged and accumulated sulfur in general proportion to the rate of air flow. Relative sensitivities of the three species to SO2, found in the laboratory, reflected those discovered in the field. A new radio chemical technique for determining S in lichen thalli is briefly outlined. (Author summary)

56530 **APTIC NO. 80841**

Ragaini, R. C., A. L. Langhorst, H. R. Ralston, and R. Heft

INSTRUMENTAL TRACE ELEMENT ANALYSIS OF CALIFORNIA MARKET MILK. *California Univ., Livermore, Lawrence Livermore Lab., Energy Research and Development Administration Contract W-7405-Eng-48, 18p., June 30, 1975. 5 refs.*

NTIS: UCRL-51859

Trace element analysis for zinc, sodium, bromine, rubidium, strontium, magnesium, aluminum, calcium, chlorine, iodine, fluorine, iron, cobalt, selenium, and cesium was carried out on 32 samples of California market milk and six samples of Colorado milk in a pilot study of toxic and nutrient trace elements in the soil to forage to cow to milk food chain. The study was undertaken to identify relationships between the trace elements in the food chain and other parameters including industrial pollution. The techniques of instrumental neutron activation analysis and X-ray fluorescence analysis are described. Intercomparisons between the two techniques were carried out as a validation of the analytical procedures. Sample collection, preparation, analysis, and data reduction procedures are discussed. The mean values and variations of trace element concentrations in milk are compared to data from other studies. (Author abstract modified)

56531 **APTIC NO. 79958**

Sasaki, S. and T. Nishimura

RELATION BETWEEN SULFUR CONTENT OF TREE LEAVES AND THE DEGREE OF AI POLLUTION IN UBE CITY. *(Ube shinai ni okeru jumoku yochu no iou ganyuryo to taiki osendo tono kankei). Text in Japanese. Sanrin Forestry), no. 1097:48-51, Oct. 1975.*

In Ube city, leaves of six plant species, Euonymus japanicus, Juniperus chinensis, Nerium indicium, willow, Pinus densiflora and P. thunbergii were collected in spring, summer, and autumn from 13 points in an industrial zone, a city area, and a residential zone, and their sulfur content were determined. The results of measuring total sulfur and water-soluble sulfur in E.j. and J.c. are described. The content of water-insoluble sulfur showed no relationship to total sulfur content, which generally paralleled th water-soluble sulfur content, suggesting that the ratio of water-soluble sulfur to total sulfur indicates the degree of air pollution due to sulfur dioxide. A linear relation was found between water-soluble sulfur and total sulfur, indicating the importance of the ratio of water soluble sulfur to total sulfur (water solubility). There was a relationship between the content o water-soluble sulfur in the leaves and the sulfur dioxide content o the air where the leaves were collected. The distribution of sulfu dioxide in the city was reflected by the water-soluble sulfur content of leaves of E.j. These findings indicate that the water soluble sulfur in leaves of E.j reflects the degree of air pollution by sulfur dioxide.

56532 **APTIC NO. 80903**

Satterlee, Lowell, N. Y. Zachariah, and R. M. Hill

IS CAR EXHAUST POISONING OUR CORN? *Farm, Ranch, Home Q., 22(1):11, Spring 1975.*

Samples of corn leaves and kernels and surrounding surface soil near highways of high, moderate, and low traffic intensity were analyzed for lead to assess the extent of automobile exhaust- induced contamination to crops. Soil, leaf, and kernel samples located adjacent to a high intensity highway (12,000-15,000 vehicles/day) showed lead levels of 4.26, 2.36, and 0.04 micrograms/5 g dry material, respectively. Samples from the same field showed reduced lead levels as the distance from the highway increased. Soil and leaf samples from a corn field adjacent a low intensity highway (250 vehicles/day) showed lead levels of 0.10 and 0.01 micrograms/5 g dry material. Kernel lead levels were undetectable.

56533 **APTIC NO. 79950**

Toda, Yoshihiro

ON THE RELATIONSHIP BETWEEN THE DISTRIBUTION OF INSECT GALLS OVER DISTYLIUM RACEMOSUM AND THE AMOUNT OF MOTOR TRAFFIC. *(Isunoki no chuei no bunpu to kotsuryo tono kankei ni tsuite). Text in Japanese. Faculty of Horticulture, Minami Kyushu Univ. no. 5:33-35 1975. 4 refs.*

In Miyazaki City a close relationship was found between the number of insect galls made by an aphid on leaves of Distylium racemosum and the amount of motor traffic. The number of insect galls on new leaves of D.r. was smaller as the amount of motor traffic was larger, probably due to the action of auto exhaust on the aphids. An increase of the galls was seen in a residential area. The leave of D.r. were healthy in places where traffic was busy.

56534 **APTIC NO. 79949**

Yamazoe, F. and H. Mayumi

STUDIES ON THE METHODS OF IDENTIFICATION OF PLANT DAMAGES DUE TO AI POLLUTION. PART IV. IDENTIFICATION OF EFFECTS ON PLANTS DUE TO SMOKE AND DUST. PART V. SUMMARY. *(Taikiosen ni yoru shokubutsu higai no kantei ho ni kansuru kenkyu, IV. Baien oyobi funjin niyor shokubutsu eikyo no kantei, V. Sokatsu). Text in Japanese. Nogyo Gijutsu Kenkyu Hokoku B, no. 27:38-50, Sept. 1975. 75 refs.*

Plant leaves were collected during 3 years beginning in 1972 from areas including a thermal power station and a steel foundry and analyzed for total sulfur, water-soluble sulfur, total iron, total manganese and total vanadium, to determine the effects of smoke and dust. The increase of the sulfur content of leaves due to absorption of the sulfur oxides in air was seen in a few areas, and there is a tendency to increased water solubility of sulfur in leaves in polluted areas. Only a few polluted areas, a small amoun of adherence and absorption of manganese and vanadium onto and into leaves due to dust fall and floating dust were noticed. Sulfur fro petroleum combustion and iron and manganese from steel foundries ar considered. It is possible to predict the degree of plant damage, including invisible damage, by identifying the pollutants which affect the plants, although it is difficult to estimate the damage from analytical values for the pollutants alone.

56535 **APTIC NO. 73311**

Yokomizo, Keiji and Tsuneo Yokoyama

ENVIRONMENTAL MEASURES AT MURORAN IRON FOUNDRY. *(Muroran seitetsusho no kankyo taisaku). Text in Japanese. Kogai Boshi Netsukanri Hokkaido (Hokkaido Assoc. Energy Pollut. Control, Japan), 28(90):5-12, Jan. 1975.*

Pollution countermeasures (sulfur dioxide, dust, water, noise), recycling procedures (slag, dust with high iron content, spent oil, fire-resistant bricks), and environmental beautification (creating native woods) at Muroran Iron Foundry, Japan, are discussed. Schematic diagrams of dust and water treatment installations are included. In order to create native woods, three guidelines should be followed: select native trees, not necessarily selecting a preponderance of pollution resistant or ornamental trees; plant seedlings close together and let them survive through rules of natural selection; and arrange the plantings so that at maturity, the natural pyramidal shape of the woods is attained (tall trees in center, shorter trees and bushes surrounding them). The living woods contribute to improvement of living conditions, but by their dying, are harbingers of environmental deterioration. Grass and trees are to make up 20% of the factory grounds. Soil is layered scientifically to provide good growing conditions. Grass-clippings are used for mulch; mature trees in construction areas are carefully moved to permanent sites.

1974

56536 **APTIC NO. 80681**

Blauel, R. A. and D. Hocking

AIR POLLUTION AND FOREST DECLINE NEAR A NICKEL SMELTER. THE THOMPSON, MANITOBA SMOKE EASEMENT SURVEY 1972-74. *Environment Canada, Edmonton (Alberta), Northern Forest Research Centre, Rept. NOR-X-115, 46p., Oct. 1974. 12 refs.*

Forest decline near a nickel smelter releasing large quantities of sulfur dioxide and particulate emissions was assessed. Aerial and ground examinations revealed varying degrees of patchy forest decline within an area of about 50 sq mi near the smelter. Up to 80% of the trees were dead in the more severely affected patches. Similar proportions of higher plant ground cover were dead, and nearly all lichens and mosses were dead. The observed gradient in the frequency and severity of injury matched that of sulfur and nickel in foliage and surface organic matter. The distribution pattern around the smelter smoke stack reflected the dominant wind directions.

56537 **APTIC NO. 73566**

Francis, C. W. and S. G. Rush

FACTORS AFFECTING UPTAKE AND DISTRIBUTION OF CADMIUM IN PLANTS. *Missouri Univ., Columbia, Tract Subst. Environ. Health, Proc. Univ. Mo. Annu. Conf., 7th, Columbia, Mo., 1974, p. 63-73. 13 refs.*

Factors affecting the uptake and distribution of cadmium in bush beans (Phaseolus vulgaris) grown in nutrient solutions were examined along with the plant availability of cadmium chloride versus cadmium oxide to Japanese millet (Echinochloa frumentacea) grown in soil under greenhouse conditions. Cadmium uptake in bush beans was the same at pH 4 or 6; however, the addition of an iron chelate resulted in nearly 10-fold greater uptakes at pH 4.6 than at 6.5. Nitrogen addition to nutrient solutions depressed Cd uptake in bush beans. Plants grown in nutrient solutions containing 0.1 ppm selenium showed lower Cd concentrations than those grown in solutions containing 0.001 ppm Se. Zinc addition enhanced Cd uptake, with plants grown in nutrient solutions containing 5 ppm Zn showing greater Cd concentrations than those grown in solutions containing only 1 ppm Zn. The short-term availability of Cd to Japanese millet was much greater from CdC12 than from CdO for acid soils; however, when the soil pH was raised to a neutral range no significant difference in Cd availability was observed. The addition of lime to the soil lowered the plant availability of both cadmium compounds. (Author conclusions modified)

56538 **APTIC NO. 80671**

Frick, Hugh and Joe H. Cherry

AN EARLY SITE OF PHYSIOLOGICAL DAMAGE TO SOYBEAN AND CUCUMBER SEEDLINGS FOLLOWING OZONATION. *Am. Chem. Soc. Symp. Ser., no. 3:128-147, 1974. 55 refs. (Presented at the American*

Chemical Society, Meeting, 167th, Division of Agricultural and Food Chemistry Symposium, Los Angeles, Calif, April 1, 1974.)

The first leaf and cotyledon of cucumber plants and the first and trifoliate leaves of soybean plants were sensitive to ozone concentrations of 24 and 50 pphm, respectively, during 4-hour exposures. Chlorophyll content and fresh weight were reduced in these tissues 24 hr after ozonation in a non-linear fashion, depending on both the dose and the stage of organ development. Short-term ozone exposures (45 + or - 5 pphm, 15 min) of seedlings were followed after 24 hr by non-linear reductions in chlorophyll/g fresh weight and stimulations in fresh weight/organ. The utilization of carbon labeled protein hydrolysate by tissue discs was not only predominantly energy dependent but was also strictly dependent on the time after ozonation in terms of inhibition or stimulation. The uptake of labelled amino acids into the soluble pools of tissue discs was sensitive to as little as 15 min of in vivo exposure (45 + or - 5 pphm), and the incorporation of amino acids into insoluble protein was sensitive during periods of 15-30 min of exposure. (Author abstract modified

56539 **APTIC NO. 73586**

Haertel, Otto and Sieglinde Miklau-Grassl

EFFECT OF SULFUR DIOXIDE ON PLANT CELLS. *(Ueber den Einfluss von SO2 auf Pflanzenzellen). Text in German. Phyton (Austria), 16(1-4):81-99, Dec. 1974. 35 refs.*

The effect of sulfur dioxide in the form of sulfurous acid on plant cells was studied by different variations of the anthocyanin color shift test. The rates of penetration of sulfurous acid and sulfuric acid into plant cells were nearly identical. Thee permeation rate decreased with increasing molecular weight of the acid, and was but slightly dependent on the dissociation constant. Sulfurous acid was much more toxic than sulfuric acid within the cells; it destroyed protoplasts 2.5 to 20 times more rapidly than did sulfuric acid with the same pH value. Sharp reduction of the water permeability was determined at a sulfurous acid concentration as low as 0.00001 N. The osmotic value and the plasma flow were slightly affected initially, while the metabolism of starch was greatly accelerated. The permeability, plasma flow, and the osmotic values had a sharp maximum at a sulfurous acid concentration of 0.001 N, and a distinct minimum at slightly higher concentrations. A further rapid increase with the starch metabolism inhibited can be regarded as premortal. The threshold value of the osmotic lesion was determined to be 17 times 10 to the -7 N, corresponding to an in-the-air SO2 concentration of 0.1 mg/cu m, which is lower than that which causes damages to domesticated plants. The experiments indicate that sulfurous acid first attacks the osmotic system of the cell by interfering with cellular SH groups.

56540 **APTIC NO. 80978**

Herich, R. and M. Bobak

INFLUENCE OF TETRAMETHYL LEAD ON THE PROPLASTIDS OF PLANT CELLS. *Acta Biol. Acad. Sci. Hung., 25(4):289-298, 1974. 8 refs.*

The influence of tetramethyl lead upon the meristematic cells of the root tips of lettuce is discussed. Tetramethyl lead was applied to lettuce plants in concentrations of 0.001% or 0.01% at 2, 6, 12, and 24 hr intervals. The following phenomena were observed: differentiation of atypical proplastids; gradual differentiation of tubular formations together with disappearance of the individuality of the proplastid, and dislocation of the tubular formations from the plastid into the basic cytoplasm after destruction of the marginal membrane. The tubular formations were dispersed in the cytoplasm or persisted in several groups. (Author abstract modified)

56541 **APTIC NO. 73199**

Honda, K.

DURABILITY OF TREES AGAINST AIR POLLUTION. *(Jumoku no kogai teikosei). Text in Japanese. J. Japan Soc. Civil Engrs. (Tokyo), 59(10):17-20, Sept. 1974. 12 refs.*

Trees are surveyed as protectors, victims, and indicators of environmental conditions. In general, broad-leaved evergreens are most resistant to pollution, while the behavior of needle-leaved evergreens can range from highly resistant to weak. Deciduous trees are affected strongly by pollution, and pollution effects appear quickly on their leaves. Growth stages, soil types, nutrition, insect infestations, meteorological conditions, and types of air pollutants (gaseous or particulate), all affect pollution resistance. Planting a protective ring of relatively pollution-resistant trees around weaker trees helps preserve the latter. A list of some sixty pollution-resistant trees (broad-leaved and needle-leaved evergreens; broad-leaved deciduous trees) of various heights (ranging from less than 5 m to more than 10 m) is included.

56542 **APTIC NO. 80670**

Howell, Robert K.

PHENOLS, OZONE, AND THEIR INVOLVEMENT IN PIGMENTATION AND PHYSIOLOGY OF PLANT INJURY. *Am. Chem. Soc. Symp. Ser., no. 3:94-105, 1974. 41 refs. (Presented at the American Chemical Society, Meeting 167th, Division of Agricultural and Food Chemistry Symposium, Los Angeles, Calif., April 1, 1974.)*

The effect of ozone on plant pigmentation, physiology, and phenol content is reviewed. Ozone impairs the integrity of the cell membranes and thus permits oxidative enzymes to oxidize phenols to their respective quinones. The quinones polymerize with amino acids, amines, and sulfhydryl groups of proteins to form low molecular weight reddish-brown pigments in leaves of ozone-treated plants. This involvement of phenols appears to be the cause of the visible necrotic lesions on injured leaves. Furthermore, concentrations of caffeoyl derivatives, caffeic, and chlorogenic acids are increased in ozone-damaged tissues. Thus, ozone exposure promotes cell degradation through a reduction in the synthesis of the products of primary metabolism as well as by increasing the products of secondary metabolism. (Author abstract modified)

56543 **APTIC NO. 73518**

Keller, T.

THE USE OF PEROXIDASE ACTIVITY FOR MONITORING AND MAPPING AIR POLLUTION AREAS. *Eur. J. Forest Pathol., 4(1):11-19, 1974. 18 refs. (Presented at the 2nd International Congress of Plant Pathology, Minneapolis, Minn., Sept. 11, 1973.)*

The peroxidase activity of various tree species was used to map zones of plant reaction in areas contaminated with air pollution. Initial experiments in a forest exposed to fluoride emissions from an aluminum smelter for over 20 yr failed because the most sensitive plants were eliminated by selection. However, the use of peroxidase activity to map zones of fluoride contamination in an apricot orchard containing small trees of genetic uniformity was successful. Fluoride concentrations as little as 10 ppm in unwashed foliage were related to increased peroxidase activity, and the enzymes activity largely coincided with the area of visible injury. Increased peroxidase activity in the foliage of white ash was related to oxidant exposure resulting from automotive emissions in an urban area, with the increases being significant even in plants showing no visible injury. Thus, the activity of the enzyme appears to offer a sensitive indication of plant exposure to oxidants and fluorides long before the appearance of plant injury.

56544 **APTIC NO. 73636**

Knapp, J. and C. Keller

UPTAKE OF LEAD AND OTHER METALS BY TREES ALONG ROADS IN THE KARLSRUHE AREA. *(Aufnahme von Blei und anderen Metallen durch Verkehrsnahe Baeume im Raum Karlsruhe). Text in German. In: Chemische Reaktionen atmosphaerischer Schadstoffe. Kernforschungsanlage Karlsruhe, Karlsruhe (West Germany), Institut fuer Radiochemie, p. 95-104, May 1974. 11 refs.*

Leaf and wood samples from trees in the Karlsruhe area were analyzed for traces of lead, cadmium, copper, and zinc by atomic absorption spectrophotometry as a function of season during the 1972-1973 period. While the copper, cadmium, and zinc concentration in both leaves and wood samples showed little variation, and therefore they can be regarded as natural elements taken up from the soil, the lead concentrations in leaves and wood samples were a function of the exposure time and of the distance from sites with high traffic density, which indicates that lead is deposited for the most part from the lower atmosphere on leaves, and taken up from the soil. The lead and other trace metal concentrations showed a consistent increase from old to young year rings. The initial lead concentrations in buds were almost the same in all samples regardless of the site. It was possible to remove 40 to 60% of the lead deposited on the leaves by washing with water. The lead content adsorbed on leaves diminished by an average of 50% from 1972 to 1973, which may be due mostly to a reduction in the lead emissions.

56545 **APTIC NO. 73519**

Koiwai, Akira, Hiroshi Kitano, Michio Fukuda, and Takuro Kisaki

METHYLENEDIOXYPHENYL AND ITS RELATED COMPOUNDS AS PROTECTANTS AGAINST OZONE INJURY TO PLANTS. *Agr. Biol. Chem., 38(2):301-307, 1974. 20 refs.*

Methylenedioxyphenyl derivatives and compounds structurally related to piperonyl butoxide, a potent protectant against ozone injury to plants, were tested for their effectiveness in preventing such injury to tobacco plants exposed to 30-50 ppm O3 for 1-2 hr. Among 90 compounds tested, 3,4-methylenedioxyphthaldehyde, benzimidazole, safroxane, xanthone, and piperonal showed high protective activity, though their effectiveness was inferior to piperonyl butoxide. An analysis of the structural differences between molecules of different effectiveness suggested that at least one aldehyde radical on the methylenedioxyphenyl ring is essential for providing protective activity to methylenedioxybenzene. The mechanism of protection was possibly related to the ability of methylenedioxyphenyl compounds to control lipid metabolism, although a definite interpretation of the protective effect was not established.

56546 **APTIC NO. 80662**

Leh, F. and J. B. Mudd

REACTION OF OZONE WITH LYSOZYME. *American Chemical Society, Washington, D. C., Div. of Agricultural and Food Chemistry, Air Pollut. Eff. Plant Growth, Los Angeles, Calif., 1974, p. 22-39. 32 refs. (April 1, Paper 3.)*

The effects of ozone on hen egg lysozyme were studied. Materials and methods are discussed, including ozonolysis, chromatographic analysis, gel electrophoresis, enzymatic activity, cyanogen bromide digestion, tryptic digestion, characterization of the enzyme substrate complex using carboxymethyl chitin, reduction of ozonized lysozyme, circular dichroism measurements, amino acid analyses, modification of tryptophan residues, and spectrophotometric measurements. The lysozyme is inactivated by ozone. The pH optimum for native and ozonized lysozyme is identical. They behave differently on ion exchange columns and in polyacrylamide gel electrophoresis but the product behaves as a single polypeptide chain. The modified residues are tryptophan, tyrosine, and methionine at 95 to 100% inactivation. Changing the pH from 4.6 to 10.2 decreases the tryptophan reacting, increases the tyrosine, and does not change the methionine. Methionine 105 is converted to methionine sulfoxide. Reversion to methionine does not restore activity. The modified tyrosine is residue 23 and the modified tryptophan residues are 108 and 111. Circular dichroism spectra of ozonized lysozyme confirmed the modification of the amino acids and showed considerable destruction of three dimensional structure. Experiments with carboxymethyl chitin indicated that the binding site of the ozonized lysozyme is unaffected. (Author abstract modified)

56547 **APTIC NO. 80663**

Rich, Saul and Harley Tomlinson

MECHANISMS OF OZONE INJURY TO PLANTS. *American Chemical Society, Washington, D. C., Div. of Agricultural and Food Chemistry, Air Pollut. Eff. Plant Growth, Los Angeles, Calif., 1974, p. 76-82. 9 refs. (April 1, Paper 6.)*

An attempt to find the mechanisms by which ozone injuries plants is summarized, including a possible anatomical basis for the flecking symptom. Flecking on the upper surface of leaves is a common symptom of ozone injury on dicotyledonous plants. The lesions are associated with contiguous stomata in the upper surface. Apparently the palisade cells lining the substomatal cavities are the cells most sensitive to ozone in these leaves. Levels of ozone that do more than fleck the upper surfaces can cause irregular spots and blotches of dead tissue on the lower surface. Changes in certain cellular constituents in plants exposed to ozone were studied. The cells of these plants leak their contents and so it is probable that the initial damage is to cellular membranes. Sulfhydryl linkages are important to the structural integrity of membrane proteins. Ozonation changes proteins sufficiently to expose and oxidize additional sulfhydryl groups. Toxic reactions in plant cells injured by ozone probably take place in the following sequence: sulfhydryl oxidation, lipid hydrolysis, cellular leaking, lipid peroxidation, and then cellular collapse.

56548 **APTIC NO. 81010**

Sawada, T., N. Date, S. Fukuoka, T. Iijima, T. Yoneyama, and T. Ohira

PLANT DAMAGE BY OZONE AND PAN AT THE OCCURRENCE OF OXIDANT OF HIGH CONCENTRATION. *(Konodo okishidanto shutsugenji ni okeru O3 oyobi PAN ni yoru shokubutsu higai ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):364, Nov. 1974.*

After an episode of high oxidant pollution in Tokyo between May 17-19, 1974, damage to spinach, Chinese cabbage, Beta vulgaris, a salting green, lettuce, Welsh onion, Japanese radish, turnip, French beans, and maize was investigated at 47 points (during May 21-26). The damage was classified by specific symptoms due to ozone and peroxyacetyl nitrate. Out of a total of 138 plants, oxidant damage was found on 114 plants, PAN-type damage on 39 plants and ozone-type damage on 39 plants. Ozone-type damage appeared on spinach, Chinese cabbage, radish, and Japanese radish. There was PAN-type damage on spinach, B.v., French beans, lettuce, and other species. The state of damage was severer in the outskirts than in the Metropolitan center. The degree of oxidant pollution at points where severe plant damage was observed had a scale value of more than 10, and higher plant damage was seen at points with higher oxidant pollution.

56549 **APTIC NO. 80859**

Sparrow, Arnold H. and Lloyd A. Schairer

THE EFFECTS OF CHEMICAL MUTAGENS (EMS, DBE) AND SPECIFIC AIR POLLUTANTS (O3, SO2, NO2, N2O) ON SOMATIC MUTATION RATES IN TRADESCANTIA. *Preprint, Brookhaven National Lab., Upton, N. Y., Biology Dept., 40p., 1974. 47 refs.*

(Presented at the Potential Genetic Effects of Environmental Pollutants on Man Symposium, Moscow, USSR, Feb. 18-21, 1974.)

NTIS: BNL 19320

The somatic mutation responses of two different blue-flowering clones of Tradescantia which were heterozygous for flower color were used to test for genetic injury induced by X-rays, chemical mutagens, and certain air pollutants and insecticides. The stamen hair system of Tradescantia proved to be an extremely sensitive indicator of genetic injury. Significant increases in mutation rate above control levels were observed for exposures to ozone, sulfur dioxide, nitrous oxide, and one pesticide. However, the data suggested that the above chemicals are at best weak mutagens in this system since the maximum response obtained was little more than twice the control rate. (Author abstract modified)

56550 **APTIC NO. 80664**

Thomson, William W., Jerry Nagahashi, and Kathryn Platt

FURTHER OBSERVATION ON THE EFFECTS OF OZONE ON THE ULTRASTRUCTURE OF LEAF TISSUE. *American Chemical Society, Washington, D. C., Div. of Agricultural and Food Chemistry, Air Pollut. Eff. Plant Growth, Los Angeles, Calif., 1974, p. 83-93. 17 refs. (April 1, Paper 7.)*

The changes induced by ozone in the fine structure of bean leaf mesophyll cells are discussed, with particular reference to both the crystalline bodies in the chloroplasts and early changes in membrane ultrastructure. Fourteen day old bean plants were exposed to 0.4 ppm ozone for 1 hr in a fumigation chamber. Samples of the leaves were taken at the end of the fumigation period, and at 1, 2, and 4 hr intervals after the fumigation period. Control samples for comparison were taken from untreated leaves. The samples were studied by electron microscope. Mesophyll cell alterations ranged from slight to severe in all samples taken after ozone fumigation. The number of cells affected and the extent of alterations were less in samples taken at the end of fumigation than in subsequent samples. The number of changed cells, the extent of the alterations, and the number of severely damaged and disrupted cells increased with time from the end of fumigation. The cell contents were collapsed into an aggregated mass in severely damaged cells. Few cellular membranes were evident. The most obvious change induced by ozone in the mild and moderately damaged mesophyll cells was the development of small to large crystalloids in the stroma of the chloroplasts. The primary reaction of ozone with the envelope membranes probably involves the disorganization of the membranes via constituents other than the lipids.

56551 **APTIC NO. 80661**

Ting, Irwin P., John Perchorowicz, and Lance Evans

EFFECT OF OZONE ON PLANT CELL MEMBRANE PERMEABILITY. *American Chemical Society, Washington, D. C., Div. of Agricultural and Food Chemistry, Air Pollut. Eff. Plant Growth, Los Angeles, Calif., 1974, p. 8-21. 17 refs. (April 1, Paper 2.)*

The actual mechanisms of ozone injury in plant systems are not fully understood. There is much evidence to suggest that ozone significantly alters the permeability properties of cell membranes. The permeability of isolated organelles can also be altered by ozone exposure. Young expanding leaves pass through a stage at which they are maximally susceptible to oxidant injury. Leaves treated with ozone absorb leucine faster than controls. Immediately after ozone exposure, treated leaves take up less carbohydrate, but after a few hours they begin to assimilate significantly more. When ozone treated cotton leaves were given labeled uracil, uracil incorporation into the ribonucleic acid fraction doubled. Probably apparent decreased water permeability results from a decreased reflection coefficient leading to solute loss and an apparent lower water transport rate. Though salt transport data suggest alterations in membrane properties, the results might also stem from reduced energy sources for transport. Cellular membranes are the initial targets for ozone injury. Many of the subsequent symptoms resulting from ozone exposure are secondary effects resulting from early changes in membrane properties.

56552 **APTIC NO. 79955**

Tominaga, Y. and T. Miyamoto

RESULTS OF SURVEY OF PHOTOCHEMICAL SMOG BY MORNING GLORY. *(Asagao ni yoru kokagaku smog no chosa). Text in Japanese. Ibaraki-ken Kogaigijutsu Center Nenpo (Annu. Rept. Environ. Pollut. Res. Center Ibaraki Pref.), no. 7:63-73, 1974.*

Damage to morning glory (Scarlet O Hara variety) due to photochemical smog was surveyed in two middle schools in Mito City and in the Kashima industrial area, along with measurement of oxidants during 2 months beginning July 1, 1974. On the leaves of morning glory in Mito City, the photochemical damage appeared on July 31, Aug. 1, 7, 20, and 23 (bleached spots and/or necrosis); on the leaves in the Kashima area the damage appeared on July 31 and Aug. 6 (bleached spots). In both areas, the damage appeared after - 2 days of high oxidant concentrations (0.12 - 0.16 ppm; 60 - 90 ppm/hr) under continued strong sunshine.

56553 **APTIC NO. 73510**

Weidensaul, T. Craig

IMPORTANCE OF PLANTS IN OXYGEN PRODUCTION, CARBON DIOXIDE CONSUMPTION, AND AIR PURIFICATION. *HortScience, 9(1):8-12, Feb. 1974. 27 refs.*

The role of plants in the oxygen-carbon dioxide cycle and their ability to purify the air are discussed. Plants are not necessarily efficient air purifiers, although certain toxic gases can be absorbed by alfalfa. Those most easily absorbed are hydrogen fluoride, sulfur dioxide, and nitrogen dioxide. Carbon monoxide is among the least absorbed of the air pollutants. Ozone, although almost as readily deposited on the surface of plant tissues as HF and SO2, appears to be somewhat less absorbed. Certain woody plants may also be significant in reducing ambient levels of SO2 in the microenvironment immediately surrounding individual leaves; however, most plants which readily absorb SO2 are also the ones most easily injured by it. More research is required for definitive statements to be made about ability of plants to purify the air without suffering significant ill effects.

56554 **APTIC NO. 79953**

Yamada, W., I. Kikuchi, and T. Goto

ON THE ANALYTICAL METHOD OF VANADIUM IN PLANTS PART 1. *(Shokubutsu-chu banajium no bunsekiho ni tsuite). Text in Japanese. Miyagi Prefectural Technical Center for Protection of Environmental Pollut., no. 3:27-30, 1974.*

Because air pollution by vanadium caused by heavy oil burning has become a human health problem, a measurement method for vanadium in plants was devised to test the relationship to air pollution. After wet-degradation of pine needles by nitric acid and perchloric acid, the vanadium content was determined by atomic absorption, using an already prepared calibration curve. The recovery was 88.8-101.3%, and the actual value was from trace to 2.60 ppm (dry matter).

56555 **APTIC NO. 80883**

Zeevaart, A. J.

INDUCTION OF NITRATE REDUCTASE BY NO2. *Acta Bot. Neerl., 23(3):345-346, June 1974. 5 refs.*

The induction of nitrate reductase by nitrogen dioxide was studied by fumigating 4-week-old pea plants initially devoid of nitrate reductase activity with NO2. Nitrogen dioxide fumigation at either the 4 ppm or 12 ppm level induced a detectable nitrate reductase activity in the leaves of the plants after just 10 min. The induction time was much smaller than those reported in the literature and may have been the result of extremely fast penetration of the gas into the leaves.

1973

56556 **APTIC NO. 80887**

Adedipe, N. O., H. Khatamian, and D. P. Ormrod

STOMATAL REGULATION OF OZONE PHYTOTOXICITY IN TOMATO. *Z. Pflanzenphysiol., vol. 68:323-328, 1973. 23 refs.*

The effects of various environmental factors on stomatal width and ozone-induced toxicity in tomato plants were investigated. Plants were protected from ozone phytotoxicity by the use of a 3-hour pre-fumigation dark period, by dry soil conditions resulting in a leaf relative turgidity of 80%, and by the foliar application of 0.000001 molar phenylmercuric acetate solution. Protected plants showed higher chlorophyll levels than did unprotected plants and were always accompanied by a marked reduction in stomatal aperture. (Author abstract modified)

56557 **APTIC NO. 80602**

Grzywacz, A. and J. Wazny

THE IMPACT OF INDUSTRIAL AIR POLLUTANTS ON THE OCCURRENCE OF SEVERAL IMPORTANT PATHOGENIC FUNGI OF FOREST TREES IN POLAND. *Eur. J. Forest Pathol., 3(3):129-141, 1973. 32 refs.*

The influence of sulfur dioxide pollution on the occurrence of pathogenic fungi of forest trees situated in industrial areas of Poland was examined in relation to the overall occurrence of such fungi throughout the country. Large differences in occurrence were observed between industrial areas and the country as a whole, particularly for the fungi Armillaria mellea, Lophodermium pinastri, Fomes annosus, Cronartium flaccidum, Melampsora pinitorqua, Phellinus pini, Cenangium abietis, and Microsphaera alphitoides. Sulfur dioxide and its derivatives acted either fungicidally or fungistatically at high concentrations, whereas at lower concentrations these pollutants behaved as stimulators. The characteristic effects of sulfur dioxide on fungi was represented as an S-curve, with differences between different fungi appearing to be only quantitative.

56558 **APTIC NO. 73617**

Mayer, R.

EVALUATION OF THE FILTERING EFFECT OF A BEECH FOREST ECOSYSTEM ON THE BASIS OF BIOELEMENT BALANCE. *(Beurteilung der Filterwirkung eines Buchenwald-Oekosystems auf der Grundlage von Bioelement-Bilanzen). Text in German. Mitt. Arbeitskreises Wald Wasser (Essen), no. 6:78-96, 1974. 5 refs. (Presented at the Colloquium of the Forest and Water Group, Wuerzburg, Germany, Nov. 22-23, 1973.)*

The filtering effect of a 125-year-old beech forest was studied by input-output measurements. The precipitation samples collected in the forest contained more sodium, magnesium, iron, aluminum, chlorine, and sulfur than samples from an open space, which is indicative of filtration effect. These elements are probably adsorbed on the leaves as gases or aerosols before they are washed out by precipitation. The sulfur input from the wash-out of sulfur dioxide is estimated at 6-17 kg/ha yearly.

56559 **APTIC NO. 76128**

Miyake, Yoshiyuki and Yoshio Uno

EFFECTS OF SULPHUR DIOXIDE ON THE GROWTH AND CHEMICAL COMPONENTS OF THE TOBACCO PLANT. VIII. STUDIES ON PHYSIOLGICAL TOBACCO LEAD SPOT. *(Tabako ni seiriteki hanten shogai ni kansuru kenkyu (dai 7 ho): aryusan gasu no chokikan bakuro ni yoru tabako no seiiku to naiyo seibun ni oyoboso eikyo). Bull. Utsunomiya Tob. Exp. Stn., no. 12:67-76, 1973. 21 refs. Translated from Japanese, 17p.*

Tobacco plants were exposed to sulfur dioxide at concentrations of 0, 14, and 30 pphm for 50 days. The plants were then harvested and the degree of injury to the tobacco leaves estimated. Extracts of the leaves, stems, and roots were analyzed. The leaves of the tobacco plants began to show symptoms of chlorosis about 10 days after the beginning of exposure to sulfur dioxide at 30 pphm. The dry weights of stems and leaves, the stem diameter, and the length and width of the largest leaves showed a decrease in one type of tobacco after exposure to sulfur dioxide at high concentrations for 50 days. The sulfur content of leaves, stems, and roots of tobacco exposed to a high level of sulfur dioxide was higher than that of the control group. The potassium and crude ash content also increased in the plants exposed to high levels of sulfur dioxide. The ratio of manganese to iron, the content of starch and dextrin, and the pH of extracts from dried leaves showed a decrease proportionate to the increase in sulfur dioxide concentration. (Author abstract modified)

56560 **APTIC NO. 73525**

Neil, L. J., D. P. Ormrod, and G. Hofstra

OZONE STIMULATION OF TOMATO STEM ELONGATION. *HortScience, 8(6): 488-489, Dec. 1973. 10 refs.*

Tomato plants at the five-six leaf stage were fumigated with 30 pphm of ozone for 2 hr at a temperature of 27 C, a light intensity of 10 klux, and a relative humidity of 50-55% to investigate the effect of the oxidant on stem elongation. Stimulated stem elongation wass observed within the first 3 days following ozone treatment, and the increased height was sustained for at least 10 days. The increased stem elongation occurred both in ozone-sensitive and ozone-tolerant cultivars and lines. (Author abstract modified)

56561 **APTIC NO. 80858**

Ruhling, Ake and Germund Tyler

HEAVY METAL POLLUTION AND DECOMPOSITION OF SPRUCE NEEDLE LITTER. *Oikos, 24(3):402-416, 1973. 34 refs.*

The decomposition rates of different fractions of spruce needle litter from numerous sites around two metal processing industries emitting copper, zinc, cadmium, nickel, and lead were studied. Highly significant negative correlations were observed between heavy metal concentration and carbon dioxide evolution rate or dehydrogenase activity of the needles. The CO2 evolution rate in partly disintegrated litters containing greater than 10 micromole of Zn plus Cu plus Cd plus Ni/g was about 0.23 mg carbon/g dry matter as compared with a CO2 evolution rate of 0.50 mg C/g for samples containing less than 5 micromole/g of the metals. Thus, the general decomposition rate is depressed by the above heavy metals, at least during those parts of the year when the water supply is adequate. (Author abstract modified)

56562 **APTIC NO. 80898**

Taoda, Hirosi

BRYO-METER, AN INSTRUMENT FOR MEASURING THE PHYTOTOXIC AIR POLLUTION. *Hikobia, 6(3 and 4):224-228, 1973. 5 refs.*

An instrument for measuring the phytotoxicity of air pollution is described. The instrument, known as the bryo-meter, consists of two growth chambers, an activated carbon filter to purify the air entering one of the chambers, and a small air pump to force ambient air into each chamber. Epiphytic bryophytes are used as plant indicators in each growth chamber, and the degree of pollution is estimated by comparing the injury of bryophytes in the unfiltered growth chamber to that in the filtered chamber. Pilot tests with six species of epiphytic bryophytes exposed to the atmosphere of Tokyo, Japan revealed injury within 2-4 wk for plants grown in the unfiltered chamber. Plants grown in the filtered chamber were not injured.

56563 **APTIC NO. 80604**

Ziegler, Irmgard

EFFECT OF SULPHITE ON PHOSPHOENOLPYRUVATE CARBOXYLASE AND MALATE FORMATION IN EXTRACTS OF ZEA MAYS. *Phytochemistry, vol. 12:1027-1030, 1973. 12 refs*

The effect of sulfite on the activity of phosphoenolpyruvate carboxylase and subsequent malate formation was studied in leaf extracts of Zea mays to obtain information on the inhibitory action of sulfur dioxide. In contrast to ribulose diphosphate carboxylase, PEP-carboxylase was not inhibited to 10 millimoles of sulfite with respect to PEP. The activity of PEP-carboxylase was inhibited non-competitively with respect to magnesium ion as is the case with ribulose diphosphate carboxylase. With respect to bicarbonate anion, PEP-carboxylase was inhibited competitively as is ribulose diphosphate. The replacement of bicarbonate anion by sulfite appeared to be facilitated by decreasing the affinity fof the enzyme for bicarbonate. At substrate saturating conditions, malate formation via the combined action of PEP-carboxylase and endogenous nicotinamide adenine dinucleotide (reduced form) dependent malate dehydrogenase in leaf extracts was not inhibited by 10 millimoles of sulfite. Although malate dehydrogenase was inhibited at this sulfite concentration to about 85%, malate formation was unaffected; PEP-carboxylase was the rate limiting step, with its turnover rate being only about 8% of NADH dependent malate dehydrogenase.

1972

56564 **APTIC NO. 80960**

Adedipe, N. O., G. Hofstra, and D. P. Ormrod

EFFECTS OF SULFUR NUTRITION ON PHYTOTOXICITY AND GROWTH RESPONSES OF BEAN PLANTS TO OZONE. *Can. J. Botany, 50(9):1789-1793, 1972. 26 refs.*

A study was conducted to determine how sulfur influences plant responses to ozone, and whether or not such an influence is dependent on temperature. Bean plants were grown in sand culture and fed with nutrient solution containing 1.3 or 32 mg/l sulfur. Three day/night temperature regimes were used: 20 deg and 15, 25 deg and 20 deg, and 30 deg and 25 deg. Plants were fumigated twice with ozone at 50 parts/hundred million for 2 hr. Intensity of phytotoxicity was markedly lower in plants grown at the high S rate. Ozone reduced chlorophyll content of plants grown in low S at 25 and 20 deg and 30 and 25 deg. Ozone had no effect on chlorophyll content with the high S treatment, particularly at the lower temperatures. Irrespective of S nutrition, ozone had no effect on total soluble carbohydrate content. Ozone effects on plant growth depended on plant part, growth temperature, and S nutrition. (Author abstract modified)

56565 **APTIC NO. 80379**

Beamish, Richard J. and Harold H. Harvey

ACIDIFICATION OF THE LA CLOCHE MOUNTAIN LAKES, ONTARIO, AND RESULTING FISH MORTALITIES. *J. Fish. Res. Bd. Can., 29(8): 1131-1143, 1972. 34 refs.*

A survey of the La Cloche Mountain Lakes in Ontario was performed to identify the cause of increased fish mortalities. Increases in acidity, amounting to more than a hundredfold in some cases over the last 10 yr, were identified as being responsible for the fish mortality rate increases. The acidity appeared to result from acid fallout in rain and snow, and the largest single source of this acid was sulfur dioxide emitted by metal smelters in Sudbury, Ontario. Measurements of pH were taken from 150 lakes in the general study during 1971 and revealed that 33 lakes were critically acidic with a pH of less than 4.5. An additional 37 lakes showed a pH of between 4.5 and 5.5 and were termed endangered. (Author abstract modified)

56566 **APTIC NO. 73515**

Hall, R., G. Hofstra, and G. P. Lumis

EFFECTS OF DEICING SALT ON EASTERN WHITE PINE: FOLLIAR INJURY, GROWTH SUPPRESSION AND SEASONAL CHANGES IN FOLIAR CONCENTRATIONS OF SODIUM AND CHLORIDE. *Can. J. For. Res., 2(3):244-249, 1972. 3 refs.*

Field and laboratory studies investigating the effect of deicing salt (sodium chloride) on eastern white pine were performed. Twice daily sprayings with 20,000 ppm NaCl solution in controlled temperature chambers resulted in foliar browning on 4-year old trees similar to that observed on trees growing near highways. The browning occurred at 15 C but not at 1.5 C. The amount of injury that developed after 3 wk at 15 C appeared to be directly related to the concentration of sodium and chloride in the leaf tissue. Repeated sampling of foliage from trees adjacent a highway between May 1970 and May 1971 revealed that foliar concentrations of Na and Cl declined from abnormally high values (up to 1%) in May to normal levels (0.02-0.01%) by August, with the rate of loss being proportional to the foliar concentration of these ions. Tree growth, as measured by bud weight, needle length, needle dry weight, needle bundles per leader, and leaf length, was suppressed on the side of trees exposed to the highway, and the suppression diminished as distance from the highway increased. Annual radial increments to the trunk were appreciably smaller in trees close to the highway. (Author abstract modified)

56567 **APTIC NO. 80885**

Ziegler, Irmgard

THE EFFECT OF SO3 -- ON THE ACTIVITY OF RIBULOSE-1,5-DIPHOSPHATE CARBOXYLASE IN ISOLATED SPINACH CHLOROPLASTS. *Planta, vol. 103:155-163, 1972. 27 refs.*

The effect of sulfite anion on the activity of ribulose-1,5-diphosphate carboxylase in isolated spinach chloroplasts was investigated at different concentrations of the enzyme, bicarbonate anion, and magnesium cation. Sulfite anion showed a non-competitive inhibition patterns with respect to both the enzyme and magnesium ion and a competitive inhibition pattern with respect to bicarbonate anion. The competitive inhibition pattern predominated at low sulfite concentrations and low internal carbon dioxide concentrations. An evaluation of the action of sulfite anion on ribulose diphosphate carboxylase in vivo requires the quantitative determination of its concentration in chloroplasts or at least within the palisade parenchyma cells.

EFFECTS-MATERIALS

1975

56568 **APTIC NO. 73357**

Komeiji, Tetsuhito, Toshio Oodaira, and Morio Kadoi

ATMOSPHERIC CORROSION OF CARBON STEEL IN TOKYO. *(Tokyo tonai ni okeru tansoko no taiki fushoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(3):577-584, 1975.*

Atmospheric corrosion rates of carbon steel at 53 sites in Metropolitan Tokyo were studied from May to October in 1972. Pieces of JIS G 314 steel were used for the study and the decrease in thickness due to corrosion (after removal of rust) was used as an index of the corrosion rate. Sulfur dioxide concentrations were measured by the conductivity method. The pollution was classified into three degrees of above 2 pphm, 2-1.5 pphm, and below 1.5 pphm, and pollution distribution as well as corrosion rates were plotted into zones according to their degrees. The degree of corrosion rates was in good agreement with SO2 distribution, with the highest corrosion rate corresponding to industrial and commercial zone, the intermediate corrosion rate to the surrounding areas, and the lowest corrosion rate corresponding to the western suburbbs of Tokyo. The effect of environmental factors on corrosion rates were quantified by multiple regression analysis.

56569 **APTIC NO. 80430**

Nisbet, I. C. T.

COMMENTS ON ESTIMATES OF MATERIAL DAMAGE. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 123-128, June 1975. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.) (Presented at Comments on Estimates of Material Damage from Air Quality and Stationary Source Emission Control, National Academy of Sciences, Washington, D. C., Commission on Natural Resources, March 1975.)*

GPO

Estimates of damage to materials exposed to sulfur dioxide pollution are critically reviewed. Uncertainties involved in estimating damage to metals and painted surfaces are analyzed, and figures of four or five times original estimates are proposed as being more consistent with original data. Factors affecting the uncertainty of such estimates include a lack of knowledge of exposure-response relationships and the relative importance of sulfur dioxide, suspended acid sulfates, and acid precipitation.

1974

56570 **APTIC NO. 73382**

Komeiji, Tetsuhito, Toshio Oodaira, Morio Kadoi, and Yoichi Yamamoto

CORROSION OF METALLIC MATERIALS BY AIR POLLUTANTS. *(Kinzoku zairyo no taiki fushoku to taiki osen ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):391, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 246.)*

Corrosion of carbon steel, stainless steel, and aluminum is studied in relation to air pollutants. The growth of corrosion in mm of metal surface is measured for 3 years at four different locations in Tokyo: two industrial, one business, and one residential areas. The cumulative amounts of atmospheric sulfur trioxide, chloride ions, and dust particles wereanalyzed at these locations for the same period. The corrosion of carbon steel at industrial, business, and residential areas was 0.12 mm, 0.10 mm, and 0.07 mm for 3 years, respectively. One of the industrial locations had the greatest corrosion of stainless steel, 0.000034 mm, while other locations had 0.000004 mm. The aluminum corrosion at industrial, business, and residential areas was 0.006, 0.003, and 0.0005 mm, respectively. The corrosion of carbon steel was related to the cumulative amount of sulfur trioxide and dust particles; greater corrosion was observed with the synergism of SO3 and dust particles. No clear relation between stainless steel corrosion and the pollutants was observed; however, some other pollutant discharged from chemical plants could have caused the large corrosion observed at one of industrial locations. Chloride ions might have been responsible for aluminum corrosion, since more corrosion was observed where a larger amount of chloride ions was recorded.

56571 **APTIC NO. 73616**

Luckat, Sieghert

THE EFFECT OF AIR POLLUTANTS ON THE BUILDING MATERIAL OF THE DOME OF COLOGNE. PART 2. *(Die Einwirkung con Luftverunreinigungen auf die Bausubstanz des Koelner Domes II). Text in German. Koeln. Domblatt, no. 38/39:95-106, 1974.*

Results of air pollutant concentration measurements on the Dome of Cologne are presented, and the effect of air pollutants on the building stones is described in comparison to similar building materials exposed in other sites. The sulfur dioxide concentrations were highest during the November-January period, and were higher than the values measured between Junee and August by a factor of 2.5 to 3. The chloride concentrations correlated with the SO2 concentrations at all sites. The SO2, chloride, and fluoride concentrations were higher on the weather side than on the lee side. Good correlation was established between the pollutant concentrations and the corrosion rates measured at the same sites. Correlation was found between the deterioration of the building stones (sandstone) and the pollutant concentrations by a comparison of similar building stones in the Dome of Cologne, situated in a highly polluted area, and those in buildings in less polluted and rural areas.

EFFECTS-ECONOMIC

1975

56572 **APTIC NO. 80584**

Fike, H. L. and J. S. Platou

NEW USES FOR SULFUR - THEIR STATUS AND PROSPECTS. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 234-241, June 1975. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.) (Presented at the Flue Gas Desulfurization Symposium, New Orleans, La., May 14-17, 1973.)*

GPO

The marketing potential of sulfur recovered from stack gas scrubbing and coal gasification processes is considered. About 15 million tons of sulfur per year are potentially recoverable from flue gas scrubbing and coal gasification processes by the mid-1980 s. Unless new uses for sulfur are found, these tonnages in addition to those resulting from other sources are expected to be considerably in excess of the sulfur demand. Potential prospects for increased sulfur use include: sulfur-asphalt paving materials, sulfur concretes, surface bond construction, coating materials, sulfur foams, and the sulfur-impregnated porous materials.

56573 **APTIC NO. 73538**

Hays, Lance, Larry Resnick, and James Wakeman

COST-BENEFIT CRITERIA FOR GASEOUS EMISSION MONITORS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 10 refs. (Presented att the Air Pollution Control Association, St. Louis Section, Specialty Conference on Continuous Monitoring of Stationary Air Pollution Sources, St. Louis, Mo., March 20-21, 1975.)*

A cost-benefit analysis for the continous monitoring of gaseous emissions from various industrial sources was performed, with particular emphasis on pollution damage and fuel savings resulting from more efficient combustion operation. An analysis of stationary air pollution sources in California indicated that a 10% reduction in emission can yield damage reduction savings in the first year equivalent too the cost of a typical continuous monitoring system ($10,000-$20,000). The use of continuous monitors for the reduction of excess air showed that for refinery heaters and boilers an annual fuel savings of more than $10,000 for 65% of all units is possible by operating at 3% flue gas oxygen. Operation at 3% O2 for industrial boilers can result in an annual fuel savings of more than $10,000 for 20% of all units. Thus, for many applications of continuous monitors, societal and user benefits exceed the cost of the monitor in the first year of operation. (Author conclusions modified)

56574 **APTIC NO. 80749**

Heigl, Anton

ECONOMY: WHAT ARE THE IMPACTS OF TAX ALLOWANCES? *(Wie wirkt die Steuerabschreibung)? Text in German. Umwelt (Duesseldorf), no. 4:18, 20-21, Aug. 1975. 5 refs.*

The impact of tax allowances for environmental protection-related investment in the chemical industry of West Germany was surveyed on the basis of questionnaire data received from 575 companies representing 71% of all employees of the chemical industry. The percentage of voluntary investments was higher at relatively small, privately owned companies than at large, publicly owned companies. The willingness to make environmental protection- related investments is dependent on the special tax allowances in the entire chemical industry, however. Typical environmental protection-oriented investments are more substantial than indirect investments in the form of technological and plant improvements. The possibility of the exploitation of the special tax allowances is greater for well-informed big companies than at medium and small companies, partly because of the red tape involved. In general, the tax advantages of the tax allowance are not rated as decisive.

56575 **APTIC NO. 80907**

Pifer, Howard W., III., Elinor L. Scholl, James M. Speyer, and Michele Zarubica

AN ANALYSIS OF RECENT ELECTRIC UTILITY RATE INCREASES. *Temple, Barker and Sloane, Inc., Energy and Environment Group, and Environmental Protection Agency, Washington, D. C., Office of Planning and Evaluation, Environmental Protection Agency Contract 68-01-2803, 108p., June 1975. 7 refs.*

Factors affecting recent electric utility rate increases are analyzed. Fuel switching from high sulfur to low sulfur fuels coupled with coal-to-oil and coal-to-gas conversions increased the total fuel bill by an estimated 2.5%. The proportion of non-fuel component rate increases due to environmental controls is roughly estimated to be 7-9%. The total costs associated with environmental clean-up during 1974 were approximately $430 million. The impact of pollution control expenditures on future electric rates is expected to be greater since the bulk of expenditures required to meet the Clean Air Act standards will be incurred during the 1975-1985 time period. (Author summary modified)

56576 **APTIC NO. 80724**

EXHAUST GAS CONTROL AND DEMAND FOR AUTOMOBILES. *(Haikigasu kisei to jidosha jyuyo). Text in Japanese. Fuji Taimuzu (Fuji Times), 25(8):14, Aug. 1975.*

The effect of automobile gas control on future consumer demand for automobiles is described. Japan s 1975 emission control law applies to new passenger cars and busses and trucks of less than 2.5 ton weight produced after April 1, 1975, while that of 1976 applies only to passenger cars. The emission standard is set in terms of the automobile model, number of cylinders, and type of fuel used. The emission levels for hydrocarbons, carbon monoxide, and nitrogen oxides in the 1975 standard are 1/10, 1/10, and 1/2 of the respective levels set in the 1973 standard. The NOx level in the 1976 standard is expected to be 7/10 to 5/10 of that set in 1975. Even tighter standards are expected after 1978. The automobile price increased accompanying emission control is about 10% in 1975, and it is expected to increase 2 to 3% in 1976. Consumer purchasing power will drop in the next 2 to 3 years, before it can be recovered.

1974

56577 **APTIC NO. 80615**

Gakner, Alexander and Robert M. Jimeson

ENVIRONMENTAL AND ECONOMIC COST CONSIDERATIONS IN ELECTRIC POWER SUPPLY. *AIChE Symp. Ser., 70(136):675-681, 1974.*

The future demand for electricity and the probable costs of meeting existing environmental control requirements are estimated. Particulate control for coal-fired units is expected to result in an annual incremental control cost of 0.29 mills/KW-hr. Sulfur dioxide control is expected to cost 3.10 mills/KW-hr for coal-fired units and 2.55 mills/KW-hr for oil-fired units. Nitrogen oxide control of coal-, oil-, and gas-fired units is projected to cost 0.85, 0.50, and 0.50 mills/KW-hr. At the prorated cost of 1.778 mills/KW-hr for environmental controls, the total incremental cost of generating electricity may reach nearly $9.9 billion annually in 1990.

1973

56578 **APTIC NO. 80428**

Thompson, R. G., R. R. Hocking, and A. M. Johnson

AN ECONOMIC MODEL FOR INVESTING IN SULFUR OXIDE CONTROL TECHNOLOGY DEVELOPMENT. *Preprint, American Inst. of Chemical Engineers, New York, 6p., 1973. (Presented at the American Institute of Chemical Engineers, Workshop Meeting, Oct. 17-19, 1973.)*

A computerized model for estimating the functional relationship between national sulfur dioxide discharges and economic investiment in control technology development is described. Estimates may be made for different product demands, allowed cost increases, and clean fuel availabilities. Control technology development may be accelerated by increased investment. Both optimal and sub-optimal solutions are calculated for an example problem. A description of the FORTRAN computer program used for the computations is provided. (Author abstract modified)

1966

56579 **APTIC NO. 73505**

Ogden, Delbert C.

ECONOMIC ANALYSIS OF AIR POLLUTION. *Land Economics, 42(2):137-147, May 1966. 11 refs.*

A welfare economics model that approximates the total cost of air pollution and the cost of specific pollutants to an air shed as well as its component parts is desccribed. Zone damages associated with the pollutants in each zone of the model coupled with the percent frequency coefficients allow the simultaneous determination of total damage and damages associated with various concentration levels for both the zones and the air shed. The relevant data can be adjusted for any abatement control planning period by discounting annual values and summing the resulting present values. Thus, growth considerations can be introduced into the analysis as well as abatement programs based on the introduction of control measures over time. The application of the marginal principle to the model indicates that the optimal program is that which equates the marginal cost of abatement to the marginal benefit from abatement, while application of the benefit-cost principle indicates that the optimum abatement program is that which results in equality among the benefit-cost ratios for each pollutant to be controlled. The two principles yield identical results if the benefit-cost ratios for the control of all pollutants equal one.

STANDARDS AND CRITERIA

1975

56580

Smola, V. I., S. A. Anurov, and N. S. Torocheshnikov **APTIC NO. 80754**

LEGISLATION CONCERNING THE STANDARDIZATION OF ATMOSPHERIC SULFUR DIOXIDE EMISSIONS. *(Zakonodatel stvo pri normirovanii vybrosov dvuokisi sery v atmosferu). Text in Russian. Vodosnabzh. i Sanit. Tekhn., no. 7:31-32, 1975. 10 refs.*

Maximum allowable daily and yearly average sulfur dioxide concentrations set in different countries (USA, West Germany, Japan, France, Great Britain, Canada, Italy, Belgium, Finland, Switzerland, Sweden, and the Netherlands), and the recommendations of the World Health Organization are presented. According to the WHO recommendations, a daily average SO2 concentration of 0.5 mg/cu m leads to increased mortality and morbity rates, and daily average concentrations between 0.25 and 0.5 mg/cu m deteriorate the status of patients with lung diseases. A daily average concentration of 0.1 mg/cu m has harmful effect on the respiratory system in the general population. Reduced visibility and irritation due to a yearly average concentration of 0.08 mg/cu m was observed. The yearly average SO2 concentration is recommended by WHO to be set at the 0.06 mg/cu m level.

56581

Train, Russell E. **APTIC NO. 80523**

NEW SOURCE PERFORMANCE STANDARDS FOR FOSSIL FUEL-FIRED STEAM GENERATORS. EPA RESPONSE TO REMAND. *Federal Register, 40(176):42045-42050, Sept. 10, 1975.*

The response of the Environmental Protection Agency to an order to consider or revise the New Source Performance Standards for Fossil Fuel Fired Steam Generators is presented. The original test method for opacity standards, which was based on instantaneous readings, was revised. The method now consists of averaging 24 readings made over 6 min and is objective. Opacity standards based on the revised method are reasonable. This position was supported by the United States Court of Appeals for the District of Columbia in the Portland Cement case. Tests made with the method at many coal fired steam generators confirm that the 20% opacity limitation is achievable.

56582

Yoshida, Katsumi **APTIC NO. 73224**

USE OF COMPUTER FOR DETERMINATION OF OVERALL AIR POLLUTION EMISSION STANDARDS IN YOKKAICHI--CONCRETE EXAMPLES. *(Yokkaichi no . ki soryo kisei ni okeru konpyuta no riyo--gutairei). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(2):30-36, Feb. 1975.*

Use of computer simulation to set overall air pollution emission standards for Yokkaichi City, Japan, is described. Air pollution by sulfur oxides emitted from oil refineries in the area caused increased occurrence of respiratory ailments in the 1960 s. Construction of high stacks (100 m or taller) alleviated the situation, but the concentration of high stacks within a given area again caused pollution problems. The Mie Prefecture Environmental Pollution Analysis Project Team was formed in April 1972 to formulate answers. Computer simulations were used to calculate enforcible standards. Big businesses, as a matter of public duty, were obligated to clean up pollution and install anti-pollution equipment. Medium and small-sized enterprises were allowed to attain environmental standards more gradually. The total emission of sulfur oxides is expected to decrease to below 0.017 ppm by 1977 in Yokkaichi City. Studies on nitrogen oxides pollution simulations have also been conducted.

56583

National Air Pollution Control Administration, Washington, D. C. **APTIC NO. 80586**

AIR QUALITY CRITERIA FOR SULFUR OXIDES. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 88-98, June 1975. (Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology.)*

GPO

Air quality criteria for sulfur oxides, sulfuric acid, and sulfates are presented. These criteria are the basis on which the ambient air quality standards for sulfur oxides are established. Adverse human health effects are noted when 24-hour average levels of sulfur dioxide exceed 300 micrograms/cu m for 3-4 days. Averse health effects are also noted when the annual mean level of sulfur dioxide exceeds 115 micrograms/cu m. Visibility reductions to about 5 mi are observed at 285 micrograms/cu m. Corrosive effects on metal materials are observed at an annual mean concentration of 345 micrograms/cu m. An annual mean concentration of 85 micrograms/cu m is capable of causing adverse effects in vegetation. Sulfur dioxide, sulfuric acid and some particulate sulfates are capable of producing bronchoconstriction in experimental animals. Concentrations of sulfur dioxide in excess of 5 ppm are capable of producing respiratory irritation in most humans. (Author summary modified)

1974

56584

Hall, Owen P., Leonard B. Collings, Stephen N. Crane, Joseph A. Licari, Peter J. Weller, and Joseph S. Welstand **APTIC NO. 80397**

AUTOMOTIVE EXHAUST EMISSION STANDARDS. VOLUME II. TECHNICAL ANALYSIS (FINAL REPORT). *TRW Corp., Redondo Beach, Calif., Transportation and Environmental Operations, California Air Resources Board Contract ARB 3-565, 183p., June 1974. 8 refs.*

Loaded mode emission standards for the proposed California vehicle inspection and maintenance program are presented. Interactions between modal emissions, mass emission and vehicle characteristics are evaluated in arriving at a set of preferred emission criteria. An initial vehicle rejection rate of approximately 30% yields the most cost-effective results for a loaded mode inspection and maintenance program. The average emissions reductions for a 30% rejection rate are 9.0%, 7.9%, and -0.9% for hydrocarbons, carbon monoxide, and nitrogen oxides, respectively. These performance estimates do not include the impact of engine deterioration. The emission standards are designed with an emphasis on hydrocarbon reductions in keeping with the reactive hydrocarbon-photochemical nature of the air pollution problem in the South Coast Air Basin. The most descriptive vehicle population classification scheme is that which includes age and engine size. The loaded mode emission standards reject approximately equal numbers among the various classification elements.

56585

Ishida, Hitoshi **APTIC NO. 80854**

PRESENT STATE OF AIR POLLUTION AND ITS REGULATION IN JAPAN. *Environment Agency (Japan), Air Pollution Control Div., World Energy Conf., 9th, Detroit, Mich. 1974, p. 1-23. (Sept. 22-27.)*

A review of the present state of air pollution and its regulation in Japan is presented. Sulfur dioxide pollution which reached a peak around 1967 and 1968 appears to have levelled off and may be decreasing. Dust fall in major cities has significantly decreased since around 1960 as a result of a nationwide energy switchover from coal to oil and the installation of industrial dust control devices. Suspended particulate concentrations are still relatively high, though they do not appear to be increasing. Nitrogen oxide levels are steadily increasing in the absence of effective controls. Decreases in carbon monoxide levels in urban areas appear to be associated with automobile exhaust emission controls. Hydrogen fluoride, hydrogen chloride, chlorine, and photochemical oxidants are among pollutants which are showing increasing levels in certain urban areas. Ambient air quality standards are established for sulfur dioxide, carbon monoxide, suspended particulates, nitrogen dioxide, and oxidants. Emission standards are set for sulfur oxides, soot and dust, cadmium compounds, chlorine, hydrogen chloride, fluorides, lead compounds, and nitrogen dioxide. A total of 15 national air sampling networks are established throughout the country. (Author summary modified)

56586 **APTIC NO. 73353**

Kubota, T. and T. Yajima

REGULATIONS FOR ORGANIC COMPOUNDS AS AIR POLLUTION COUNTERMEASURES. (NO. 2) REGULATIONS AND THE NECESSITY. *(Taiki osen taisaku toshite no yuki kagobutsu no kisei. Dainikai kisei to sono hitsuyosei). Text in Japanese. Kagaku Kojo (Chem. Factory), 18(10):84, 1974.*

Organic compounds are regulated by three different standards depending on local governments. An emission exit standard was adopted by Kanagawa, Hiroshima, Saitama, Miyagi, and Mie Prefectures, ground concentration standards by Wakayama and Hyogo Prefectures, and border line of lot concentration standards by Osaka-fu, Wakayama, Hyogo, and Nara prefectures. Osaka-fu also set K values for various compounds. The reactivities of hydrocarbons with nitrogen oxides at static state are in the decreasing order of tetramethylethylene, trans-2-butene, cis-3-hexane, isobutene, 1,3-butadiene, propylene, m-xylene, p-xylene, ethylene, hexane, octane, and pentane. The degrees of eye irritation of hydrocarbons at a scale of 0 to 10 range from 0 for n-butane and n-hexane to 2.3 for o-xylene and 2.5 for p-xylene to 8.9 for styrene and methylstyrene. Other strong eye irritating compounds are oxidants including aldehydes, formalin, acrolein, and peroxyacetyl nitrate.

56587 **APTIC NO. 73249**

Schoenberg, Janet B. and Charles A. Mitchell

IMPLEMENTATION OF THE FEDERAL ASBESTOS STANDARD IN CONNECTICUT. *J. Occup. Med., 16(12):781-784, Dec. 1974. 17 refs.*

Problems involved in the implementation of the Federal asbestos standard issued by the Occupational Safety and Health Administration (OSHA) were investigated by contacting 38 asbestos manufacturers and 25 contractors in the state of Connecticut. The standard sets permissible levels for exposure to asbestos fibers, makes mandatory certain environmental controls and monitoring, and requires annual medical examinations. Thirteen of 24 asbestos manufacturers who considered themselves covered by the standard were uninformed about the specific details of the standard. Seventeen of these 24 companies reported some measurements of asbestos fiber concentrations, while none of the contractors had ever monitored dust levels at job sites. There was considerabl confusion about the standard s applicability since the OSHA standard does not include a definition of exposure based on objective measurements of fiber levels. The standard also does not deal with the problem of what temporary or incidental degree of exposure should be considered as exposure under the law. The standard s lack of guidelines for conducting the medical examination was also a source of confusion.

56588 **APTIC NO. 80399**

Shannon, L. J., P. G. Forman, and W. Park

FEASIBILITY OF EMISSION STANDARDS BASED ON PARTICLE SIZE (FINAL REPORT). *Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-01-0428, Program Element 1HA091. Rept. EPA-600/5-74-007, 233p., March 1974. 89 refs.*

An assessment of the technical and economic feasibility of particulate emission standards based on particle size is presented, with particular emphasis on standards for regulating the emission of fine particulates below 2 micron in size. Emission standards based on particle size generally appear to be both technically and economically feasible, with the most realistic approach being to tailor the emission standard to specific sources of fine particulate pollutants. Estimates of the costs associated with the control of fine particulates vary from less than 1.0% to 20% of the value of the product, depending on the particular industy involved. A limited cost/benefit analysis reveals that the optimum control efficiency for fine particulates varies with population density. (Author abstract modified)

56589 **APTIC NO. 80682**

TRW Inc., Redondo Beach, Calif., Transportation and Environmental Operations

AUTOMOTIVE EXHAUST EMISSION STANDARDS. VOLUME I. EXECUTIVE SUMMARY (FINAL REPORT). *California Air Resources Board Contract ARB 3-565, 39p., June 1974.*

Loaded mode emission standards for the proposed California vehicle inspection and maintenance program are presented. Interactions between modal emissions, mass emissions, and vehicle characteristics are evaluated in arriving at a set of preferred emission criteria. The average emission reductions for a 30% rejection rate are 9.0%, 7.9%, and -0.9% for hydrocarbons, carbon monoxide, and nitrogen oxides, respectively. These performance estimates do not include the impact of engine deterioration. The emission standards are designed with an emphasis on hydrocarbon reduction in keeping with the reactive hydrocarbon-photochemical nature of the air pollution problem in the South Coast Air Basin. The most descriptive vehicle population classification scheme includes age and engine size. The analysis yields loaded mode emission standards which reject approximately equal numbers among the various classification elements. (Author conclusions modified)

1973

56590 **APTIC NO. 80628**

Finklea, John F.

CONCEPTUAL BASIS FOR ESTABLISHING STANDARDS. *National Academy of Sciences and National Research Council, Washington, D. C.. Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc. 1973. p. 619-667. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Several questions are considered concerning the conceptual basis for the primary ambient air quality standards. The law assumes that a threshold exists for each pollutant and adverse health effect. Adverse effects include both aggravation of existing diseases and an increased frequency of health disorders. The Clean Air Act requires that primary ambient air quality standards be set to protect fully both specifically susceptible subgroups and healthy members of the population. Expecially susceptible population segments include persons with existing diseases which may be aggravated by exposures to elevated levels of pollutants in the ambient air. Major information gaps are listed. A minimally adequate health inteligence base should ascertain the effects of long term low level and single or repeated short term exposures, and consider the health effects of pollutant interactions. The present health information data base is discussed in relation to sulfur dioxide, particulate sulfates, total suspended particulates, nitrogen oxides, carbon monoxide, and photochemical oxidant exposure. The uncertainty in present best judgments for effects thresholds is larger than the safety margins contained in the standard in most cases. The safety margins associated with the primary ambient air quality standards are discussed. Health risks from air pollution are compared with reference to aggravation of asthma and cardiorespiratory symptoms and frequency of chronic respiratory disease symptoms and common respiratory illnesses. Since control costs are generally exponential functions, uncertainties about a standard requiring stringent emission control will result in major uncertainties in the justification of control costs. The need for adequate scientific information is emphasized.

56591 **APTIC NO. 79961**

Hayashi, Satoshi and Miyoko Hayashi

ENVIRONMENTAL STANDARDS FOR SULFUR OXIDES AND NITROGEN OXIDES: THERMAL POWER PLANTS AND POLLUTION. *(Iou to chisso no sankabutsu no kankyo kujun: Karyoku hatsudensho to kogai). Text in Japanese. Denryoku Sangyo To Kogai (Power Ind. Pollut.), no. 6:12-18, Sept. 1973.*

Deficiencies in choice of emission values as environmental standard for sulfur oxides and nitrogen oxides are discussed. Sulfur oxides and nitrogen oxides are pollutants emitted by power plants. The Yokkaichi pollution litigation resulted in official recognition of pollution-caused illnesses. These illnesses can be caused by above-threshold pollutant concentrations. Threshold concentrations are the values chosen as environmental standards. However, at below-threshold pollutant concentrations there is an indefinite region, where illnesses may be latent. It is desirable to establis environmental standards at values below this indefinite region. Environmental Pollution Control Regulations of 1967 divided pollution effects into two categories: those affecting health; and those affecting living conditions. The balance between living conditions and industrial development has often been precarious, an often in favor of industry. Data on nitrogen oxides for establishing environmental standards is lacking. Emphasis is place on nitrogen dioxide control, but nitric oxide is present in roughly the same amounts.

LEGAL AND ADMINISTRATIVE

1975

56592 **APTIC NO. 80983**

Ashby, Eric

THE POLITICS OF NOXIOUS VAPOURS. *Glass Technol., 16(3):60-67, June 1975. 27 refs.*

The development of air pollution legislation in Great Britain to control noxious vapors is discussed. The Alkali Act of 1863 applied only to the alkali industry and controlled only hydrogen chloride, allowing a 5% tolerance. In 1874 the wet copper process industry was put under control and the tolerance for HCl was put at 0.2 gr/cu ft. The Works Regulation Act of 1881 added two more fixed standards, not more than 1 gr of sulfur or half a grain of nitrogen for acids composed of S or N_2. All noxious vapors were to be controlled by the best practical means. This Act remains the pattern for the policies of noxious vapors. It has five important aspects. Measures for control are firmly tied to the capacity of science and technology to make them effective at reasonable cost. The policy is not one of prevention. The policy does not recognize that the cost of abating pollution may exceed the cost of the damage done by pollution. The policy is flexible and enforcement depends upon the competency and integrity of the inspectors.

56593 **APTIC NO. 80562**

Cant, N. W.

AIR POLLUTION DUE TO MOTOR VEHICLES: PART I, AIR-POLLUTION STANDARDS AND CONTROL STRATEGIES. *Proc. Roy. Australian Chem. Inst., 42(10):273-279, Oct. 1975. 43 refs.*

The air pollution standards and control strategies for air pollution due to motor vehicles in Australia are discussed. Automobiles account for 50% of hydrocarbon pollution, 64% of carbon monoxide pollution, 27% of nitrogen oxides pollution, and less than 1% of sulfur oxides pollution. The Australian standards are based on the so-called best practical means approach. Australian Design Rules 26 and 27 are based on the Economic Commission for Europe Rule 15 and permit emissions which increase with vehicle weight. They are primarily aimed at CO with no limits for NOx. The requirements specified by Australian Design Rule 27A which applies from July 1976 are identical with the United States Federal 1973 standards. Exhaust emissions can be controlled by promoting more uniform mixing and reducing the surface area at which quenching occurs; increasing air-fuel ratio; arranging lower cooling; and reducing peak combustion temperatures.

56594 **APTIC NO. 73587**

Detrie, J.-P.

MONITORING NETWORKS FOR THE STUDY OF THE LONG-DISTANCE TRANSFER OF POLLUTANTS. *(Les reseaux de mesure pour l etude des transferts a grande distance des polluants). Text in French. Centre Interprofessionel Technique d Etudes de la Pollution Atmospherique, Paris (France), Etudes Documentaires, no. 45, (CI 859): 12p., 1975. (Presented at the 3rd Protecna International Exhibition, Rouen, France, March 17-21, 1975.)*

Existing or planned national and international networks for the study of the long-distance transport of pollutants are surveyed. Systematic precipitation measurements have been conducted by 140 stations of the Rossby and Eriksson network since 1955, in which the chlorine, sulfur, sodium, potassium, magnesium, and calcium ion concentrations and the pH value of the precipitation are evaluated. The data obtained by this network show the deposition of considerable amounts of sulfur over Europe, and especially in England and Scandinavia. Sulfur dioxide, precipitation, sulfate, sodium, and magnesium transfer processes are studied by the OECD network with 68 stations in Switzerland, West Germany, Denmark, France, Norway, Sweden, Finland, and the United Kingdom. The findings indicate highest emissions levels to be situated in the Ruhr area, West Germany, and in East Germany. Eulerian and Lagrangian models are used for the study of long-distance transfer of SO_2. The World Weather Watch system established by the World Meteorological Organization, including regional stations which supply monthly averages, and background stations in areas remote from any pollution sources, is concerned with solar radiation, atmospheric ozone, atmospheric electricity, and precipitation. The monitoring stations of the Commission of the European Communities, established in urban and industrial areas, monitor SO_2 and suspended dust.

56595 **APTIC NO. 80564**

Ferrar, Terry A., Peter G. Sassone, and Alan B. Brownstein

EFFLUENT CHARGES AND POLITICAL REALITIES--A QUALIFICATION. *J. Environ. Syst., 5(2):95-101, 1975. 9 refs.*

The potential of the effluent charge concept as a practical solution to environmental degradation is discussed. The implications of the approach were examined in relation to the experience of New York City during the winter of 1972-1973 hen the city was faced with a low sulfur residual fuel oil shortage. The city uses a financial incentive scheme to encourage the use of environmentally desirable fuels. The variance strategy, due to both political and legal considerations, was constrained by a fairness principle. Differential air shed management reflecting the diverse meteorological characteristics was not permitted. All consumers of residual fuel oil faced the same effluent rate structure regardless of their location within the New York City air shed. This legally specified principle of fairness effectively prohibited the construction of an optimal effluent charge. (Author abstract modified)

56596 **APTIC NO. 80688**

George, Harvey F.

GRAVURE INDUSTRY S ENVIRONMENTAL PROGRAM. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 9p., 1975. 17 refs. (Presented at the Environmental Aspects of Chemical Use in Printing Operations Conference, King of Prussia, Pa., Sept. 22-24, 1975.)*

An environmental program established by the Gravure Research Institute and the Gravure Technical Association to assist gravure printers and engravers in complying with pollution and worker safety regulations is described. The program includes an environmental newsletter which serves as a communications link between information clearinghouses and members of the gravure industry, environmental and safety seminars, an environmental laboratory and technical service program, an environmental research program, and participation by representatives of the GRI and GTA at regulatory hearings. The environmental laboratory maintains various analytical instruments, personal monitoring pumps for hazardous conditions, and stack emission sampling equipment. The technical service program is involved in air pollution studies of solvent vapor emissions from gravure press stacks as well as from other plant areas.

56597 **APTIC NO. 73626**

Guderian, R.

PROPHYLACTIC AIR POLLUTION PREVENTION BY SPACE PLANNING MEASURES. *(Prophylaktischer Immissionsschutz durch Raumordnungsmassnahmen). Text in German. Schriftenreihe der Landesanstalt Immissions und Bodennutzungsschutz Landes Northrhein-Westfalen, Essen, no. 33:25- 29, 1975. 11 refs.*

A 3-step model as a space planning measure for air pollution prevention is presented. Space planning as a first step represents a highly generalized overall plan on a national or regional level for a large-scale regional differentiation with respect to possible air pollution effects on the ecological and economic potentials to achieve or maintain optimal possibilities of land use in the entire region. Space allocation as a next step on the communal level serves to arrange different types of areas intended for specific uses in such a manner that harmful effects of industrial and other emission sources on residential or other areas to be protected can be avoided. The necessary distances between industrial and protected areas should be determined on the basis of pollution forecasts. Site selection as a last step must ensure a siting of industrial and other emission sources in such a manner as to achieve minimum pollution load on the neighborhood.

56598 **APTIC NO. 73551**

Hinton, David O., Jose M. Sune, and Raymond A. Meyer

FIELD OPERATIONS MANAGEMENT OF AIR QUALITY MEASUREMENT TO ENSURE DATA VALIDITY. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., 11p., 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-61.7.)*

Field management of the 23-station Community Health Air Monitoring Program (CHAMP) is described. The management operations utilize a dynamic closed loop system to evaluate and maintain data validity. Flexibility is provided to enable an investigator to enter the loop at any point for overall system evaluation. The system provides for individual parameter evaluations from all stations and specific station evaluations for all instruments and associated parameters. The management process utilized data on instrument stability and reliability to establish or modify both the frequency and accuracy of the overall system calibration. Status summaries from automated instrumentation provide visibility for field managment and make possiblee meaningful machine data validation. Data for 1974 appear to be accurate to within 20%, and 1975 data are expected to approach accuracies within 10%. (Author abstract modified)

56599 **APTIC NO. 80911**

Johann, Hubert-Peter and Klaus-Dieter Schoettler

PLANT COMMISSIONER FOR IMMISSION PROTECTION: AN OFFICE WAITS TO RECEIVE PROFILE. *(Betriebsbeauftragter fuer Immissionsschutz. Ein Amt wartet auf Profil). Text in German. Umweh (Dusseldorf), 5(4):13-17, 1975.*

The position and tasks of the commissioner for environmental protection, a new position required by law in West Germany, are described. The commissioner for environmental protection should act as a mediator between the company and the supervising authority for environmental protection, balancing the company interests in terms of economy and technological possibilities and requirements against environmental concerns. He should not be a scapegoat of the company or supervising authority. Consistent representation of the company in environmental matters toward the supervising authority and the community, information, pooling of experience, and participation in investment-related decisions are the basic tasks of the commissioner. He is to ensure compliance with environmental and emission standards.

56600 **APTIC NO. 80680**

MacKay, D. Robert and D. Glenn MacDonell

ENVIRONMENTAL MONITORING. A COMPENDIUM OF DATA GATHERING ACTIVITIES OF ENVIRONMENT CANADA. *Environment Canada, Ottawa, Planning and Finance Service, Rept. 4, 50p., 1975.*

A summary of on-going environmental monitoring and data gathering activities of Environment Canada is presented. Activities of the Atmospheric Environment Service and the Air Pollution Control Directorate are included. The principal network which represents the core of the AES s commitment to data collection consists of 295 synoptic observing stations. Stratospheric ozone measurements are also made by the AES. The National Air Pollution Surveillance Program of the Air Pollution Control Directorate consists of 347 sampling instruments in 42 cities across the 10 provinces. Measurements of sulfur dioxide, particulates, carbon monoxide, hydrocarbons, nitrogen oxides, and total oxidants are being made. Hydrogen sulfide is also being measured in certain local areas.

56601 **APTIC NO. 81026**

Matsuzaki, Naruyasu

ENVIRONMENTAL CONTROL SYSTEM: AS ONE OF THE OVERALL MANAGEMENT SYSTEMS FOR REGIONAL DEVELOPMENT. *(Kankyo seigyo sisutemu: Chiiki seibi no tamento sogoteki na kanri sisutemu no ikkan to shite). Text in Japanese. Opereshionza Risachi (Operations Research), 20(9):4-12, Sept. 1975. 17 refs.*

Concepts of environmental control systems with consideration of present economic conditions and future industrial projects are discussed with a systems approach to environmental control for regions. Computer assisted long range comprehensive planning systems for regional project impact assessment are described with block diagrams of public project planning (necessary functions), information at each phase of regional project planning (multi-stage assessment), computer assisted systems for environmental control (monitoring, prediction and assessment for project planning), man-machine communication (prediction of pollutant concentration distribution at ground level), control for data model and system operations, long range comprehensive planning and regional planning, and computer systems for environmental control (monitoring, pollutant diffusion simulation, environmental assessment).

56602 **APTIC NO. 80924**

Miyahara, Masatoshi

FUTURE TREND OF THE PHOTOCHEMICAL SMOG CONTROL MEASURES. *(Kongo no kokagaku sumogu taisaku no hoko ni tsuite). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:33-38, Sept. 1975*

Future trends in the photochemical smog control policy set by the Photochemical Smog Control Promotion Conference of July 1972 are described. This conference has been conducting local air pollution surveys, enforcing automotive traffic regulations, insuring installation of auto exhaust gas emission controls, controlling aromatic hydrocarbons in gasoline, and promoting school health control. These efforts culminated in an oxidant forecasting system throughout Japan to control the sources of oxidants before emergence of a smog crisis. A total of 425 oxidant meters were installed at observation stations in 1974. The following objectives were selected: continuation of fundamental research and investigation of photochemical smog; preventive control of photochemical smog; new research, including a fact-finding survey of photochemical smog and a study on air pollution analysis technology; study of photochemical reactions and effects of smog on organisms; forecast and observation systems; public health control; and international cooperation.

56603 **APTIC NO. 80928**

Miyahara, Masatoshi

SURVEY AND RESEARCH ON THE PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku taiki osen ni kansuru chosa kenkyu). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:55-59, Sept. 1975.*

Research since 1972 on photochemical air pollution by the Air Protection Planning Office of the Japanese Environmental Agency, is reported. Research and investigation for fiscal years 1972 to 1972 include a fact-finding survey of photochemical smog at the Tokyo Bay area and the Osaka Bay area, and a study on the effects of photochemical smog on public health and vegetation. Studies conducted by the institutes of the Metropolitan Police Office, the Ministry of Health and Welfare, the Ministry of International Trade and Industry, the Ministry of Postal Services, the Ministry of Labor, and the Ministry of Agriculture and Forestry are also described.

56604 **APTIC NO. 73216**

Moriguchi, Minoru

INTRODUCTION OF COMPUTERS TO POLLUTION ENFORCEMENT: WITH REFERENCE TO OVERALL EMISSION STANDARDS FOR SULFUR OXIDES. *(Kogai gyosei ni okeru konpyuta no donyu: Iou sankabutsusoryo kisei to kanren shite). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(2):25-29, Feb. 1975.*

The application of computers to pollution enforcement is discussed. Procedures are described for setting up simulations, in particular, for regional determinations of total permissible emission values of SOx. A flow diagram is given.

56605 **APTIC NO. 73218**

Naito, Yutaka

PROCEDURES FOR ENVIRONMENTAL ASSESSMENT, AND EXAMPLES. *(Kankyo asesumento no hoho to jirei). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(3):53-60, March 1975. 8 refs.*

Philosophies behind technological assessment vs. environmental assessment are discussed. Environmental assessment can be defined as evaluation-before-the-fact. Brain-storming, multidimensional analyses, statistical weighting, and check lists, are used in environmental assessment. Statements by individuals, physical models, and systems dynamics are tools for evaluation. It is most necessary that limits of application of assessment be understood in practical and human terms. Environmental assessment of traffic systems is described as an example of evaluation-before-the-fact.

56606 **APTIC NO. 73303**

Odaira, Toshio

ANNOUNCEMENTS OF WARNING MADE IN EMERGENCIES OF PHOTOCHEMICAL SMOG IN JAPAN. *(Wagakuni ni okeru kokagaku sumoggu no kosatsu). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(5):1, Jan. 1975. 21 refs.*

Oxidants as photochemical reaction products in Japan are reviewed. Ozone comprises 85% to 90% of oxidants and high oxidant levels tend to appear during April through October. Ozone levels higher than 0.1 ppm in Tokyo appeared frequently in July and August accounting for 72% of the high levels observed during April through October in 1973. During the same period, many elementary and high school students complained of headaches, eye irritation, and sore throat, which were due to the high oxidant levels. Although the primary pollutants, such as sulfur dioxide, nitric oxide, and carbon monoxide, have been thought to be the cause of the complaints, this theory cannot be justified because lower levels of these pollutants were observed in this period than in winter. A photochemical smog warning is announced in Japan whenever the atmospheric oxidant level reaches 0.15 ppm. The numbers of such warnings made have been increasing every year. This does not mean that the atmospheric oxidant level is increasing; rather it is the result of improvement of analytical techniques and the establishment of monitoring systems for oxidant levels in larger areas. The places at which photochemical smog warnings were announced are distributed in a large area of Japan, however they are mostly located on the side of the Pacific Ocean.

56607 **APTIC NO. 73549**

Parry, Edward P., Robert M. Burton, Walter M. Kozel, and George H. Ward

THE QUALITY CONTROL SYSTEM FOR THE COMMUNITY HEALTH AIR MONITORING PROGRAM. A PLAN FOR ASSURING RELIABLE COLLECTION OF AEROMETRIC DATA. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab. and Rockwell International, Newbury Park, Calif., Air Monitoring Center, 20p., 1975. 4 refs.*

The quality control system for the Community Health Air Monitoring Program is described. The total system quality control plan is divided into two separate portions: one that covers the quality assurance used during system design and manufacture and another that assures proper operation and maintenance of the system. Included in the system are items such as component evaluation, system evaluation, system design certification, complete analysis of a prototype field station, and the development of standard calibration procedures which relate measured parameters to standards of National Bureau of Standards and/or Environmental Protection Agency reference methods. Continued surveillance of component, system, and operator performance through inspection, quality control testing, and independent injection of pollutant standards into the measuring system is also utilized. The quality control program includes auditing of both the sensors and the electronic data acquisition and analysis systems.

56608 **APTIC NO. 76131**

Pianko, Marc

METHODOLOGY FOR AIRPLANE NUISANCE CERTIFICATIONS. *(Methodologie de la Certification des Nuisances des Avions). Preprint, National Office for Aerospace Studies and Research, Chatillon (France), 1975.*

(Presented at the International Aeronautical Congress, 12th, Paris, France, May 29-30, 1975.) Translated from French, 43p.

Three approaches to certification of airplane nuisances are examined: acceptability by residents, usefulness of airplanes, and best technological effort. A methodology is proposed based essentially on the third course, but which takes into account the requirements of the first two. The establishment of certification leads to a procedure that comprises three steps: classification of the airplanes, description of the nuisance, and choice of the limit levels or severity of the norm. The problems of each stage are examined and solutions are proposed for regulation of both noise and air pollution. It is possible to define and quantify nuisance due to airplane noise and gaseous pollutants. It is also possible to define engine test procedures to measure the noxiousness of each pollutant. Concepts used to describe and represent nuisances are identical to those used in classification of airplanes. Difficulties in choosing limit levels are discussed. (Author abstract modified)

56609 **APTIC NO. 80505**

Poehls, Herbert

CONSERVATION OF CLEAN AIR AND NOISE ABATEMENT - PROBLEMS CONCERNING GOVERNMENTAL TRAFFIC PLANNING. *(Luftreinhaltung und Laermbekaempfung - Probleme in der staatlichen Verkehrsplanung). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 117(15/16):713, 1975. (Full text available from VDI-Verlag GmbH, 4 Duesseldorf 1, Postfach 11 39, West Germany.)*

General problems of air pollution and noise as a consequence of increased motorization in urban agglomerations, and system analysis of clean air maintenance and noise abatement as problems of traffic planning and environmental planning in West Berlin are summarized. The steep rise in the costs of maintaining an automobile, and the increased price of gasoline during the last few years have not been a deterrent to individual transportation. Some 50-60% of the commuters use individual means of transportation in urban agglomerations, and this figure is expected to increase further.

56610 **APTIC NO. 80769**

Quarles, John

PART 52 -- APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PUERTO RICO IMPLEMENTATION PLAN; REVISION. *Federal Register, 40(177):42191-42194, Sept. 11, 1975.*

A proposed revision to the portion of the Puerto Rico implementation plan dealing with sulfur compound emissions was submitted. There is some question whether the modeling technique was applied correctly in all cases. The maximum allowable sulfur content of fuel for some sources in the Barceloneta, Ensenada, and Santa Isabel areas was determined without accounting for terrain in the vicinity of the sources. Consequently, the maximum allowable fuel sulfur content for seven sources in the Barceloneta and Ensenada areas was disapproved. Public comments on the proposed revision are analyzed. The Code of Federal Regulations is amended to indicate supplemental information submitted on the plan. The plan does not provide for attainment and maintenance of the national standards for sulfur oxides in the areas of Aguirre, Barceloneta, Trujillo Alto-Dorado, and Ensenada. The original fuel sulfur limitations apply to those sources for which the amendment was disapproved. The only exception is the limitation for the Puerto Rico Water Resources Authority Aguirre complex, which shall be 2.5% by weight. The proposed permission of stack height increases in lieu of available methods of emission reduction is disapproved.

56611 **APTIC NO. 80770**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. KANSAS: APPROVAL OF COMPLIANCE SCHEDULES; CORRECTION. *Federal Register, 40(177):42190-42191, Sept. 11, 1975.*

An introductory paragraph in the Code of Federal Regulations is revised to correct a discrepancy in the wording. The paragraph pertains to compliance schedules for Kansas that were disapproved. The revised language is included.

56612 **APTIC NO. 73434**

Sato, M.

LARGE SCALE PROJECTS FOR 10TH YEAR. *(10-nenme o mukaeta ogata purojekuto). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 28(4):269, 1975.*

Since 1968, the Agency of Industrial Science and Technology, Ministry of International Trade and Industry, has been operating the Large Scale Projects in which researches have been made on desulfurization techniques, electric car, and energy conservation. The developments in desulfurization technique were divided into desulfurizations of heavy oil and flue gas. The former study was completed in 1971 and necessary desulfurization data were collected from an experimental desulfurization plant which employed the hydrogenation of heavy oil with a catalyst. Flue gas desulfurization techniques developed were active manganese oxide and active carbon methods for which a 150,000 N cu m/hr experimental plant was constructed and this study was completed in 1968. New batteries, such as zinc-air, iron-air, and sodium-sulfur for electric cars have also been studied; however, the difficulty remains with the heavy weight of batteries. The difficulties in the Large Scale Projects were the insufficient engineering knowledge of researchers, for which outside help was asked, and difficulties in the construction of experimental plants because of the opposition by the inhabitants. The governmental budgets for these researchers were renewed every year, which made large and long term experiments difficult.

56613 **APTIC NO. 80985**

Severs, Richard K.

THE OXIDANT CONTROVERSY. *Chemosphere, 4(6):346-355, Dec. 1975. 25 refs.*

A national U. S. primary ambient air quality standard was promulgated to insure protection of the citizenry from the effects of photochemical smog. The epidemiological relationships between eye irritation, respiratory problems, and other measures of ill health have been confounded by noncomparable measures of oxidant levels. Clinical and toxicological studies have failed to develop sufficient etiological evidence to support an oxidant standard per se. Due to its ease of measurement and its close relationship to high net oxidant levels in the Los Angeles basin, ozone measurements have become, for most intents and purposes, the official measure of photochemical oxidants. This equivalence is open to question in many areas. Proposed reduction of vehicular miles might not be effective in many areas. Other mechanisms have been suggested which account for the presence of ozone. These arguments are strengthened by the lack of eye irritants and crop damage usually associated with photochemical smog production as well as high levels of ozone found in rural areas. The lack of a comprehensive understanding of what goes on in the atmosphere with regard to ozone makes it a questionable surrogate for photochemical oxidants. The present level may be suggested as a necessary but not sufficient condition to assure presence of photochemical smog. The question of sufficient evidence could be handled by other atmospheric measurements. (Author abstract modified)

56614 ***APTIC NO. 80926***

Shintani, Kozo

INTERNATIONAL TREND REGARDING PHOTOCHEMICAL AIR POLLUTION. (Kokagaku taiki osen ni kansuru kokusaiteki doko). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:16-29, Sept. 1975.

The policy direction of the Air Management Sector Group (AMSG) of the Organization for Economic Cooperation and Development (OECD), and U. S.-Japanese environmental policy are discussed. An AMSG special conference held in Tokyo during Sept. 20-29, 1972, and the Exploratory Meeting on Oxidants and their Precursors in the Atmosphere held in Paris during January 30-31, 1973 are discussed. A summary of the photochemical air pollution of the countries which belong to OECD is given. Other conferences reported on are: the U. S.-Japan Ministerial Level Conference on Environmental Policy, agreed on by President Nixon and Premier Sato, held in Tokyo in October 1970, and the U. S.-Japan Photochemical Air Pollution Conference held in Tokyo during June 11-15, 1973.

56615 **APTIC NO. 80993**

Simeons, Charles

IMPACT OF BRITISH LEGISLATION UPON DISPOSAL OF WASTE. *Luton, Bedfordshire (England), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, 5p. (Nov. 3-5.)*

The impact of British legislation for air pollution upon the disposal of waste is discussed. Air pollution and odor are regulated by the Control of Pollution Act of 1974. At present much heat is wasted. Government - backed research is needed to study the production of fuel from refuse that is presently incinerated. Legislation can be designed that will encourage companies to make more economical use of wastes.

56616 **APTIC NO. 80560**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. MAINTENANCE OF NATIONAL AMBIENT AIR QUALITY STANDARDS. *Federal Register, 40(175):41941-41953, Sept. 9, 1975.*

The full, final identification of air quality maintenance areas (AQMAs) in 19 states is announced. The states are Arizona, Arkansas, California, Delaware, District of Columbia, Florida, Kansas, Kentucky, Maryland, Missouri, Nevada, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. Eight implementation plans are approved under the air quality maintenance provisions of 40 Code of Federal Regulations 51.12 e and nine are disapproved. Georgia was previously approved and Ohio was previously disapproved. A total of 66 AQMAs are identified for at least one pollutant. Of these, 64 are identified for particulate matter, 19 for sulfur dioxide, 7 for carbon monoxide, 24 for photochemical oxidants, and 2 for nitrogen dioxide.

56617 **APTIC NO. 80579**

Wharton, James C.

JUDICIALLY ENFORCEABLE RIGHTS UNDER NEPA. *California Univ., Livermore, Lawrence Livermore Lab., Energy Research and Development Administration Contract W-7405-Eng-48, 43p., May 21, 1975. 54 refs. NITS: URCL-51828*

A review of judicially enforceable rights under the National Environmental Policy Act is presented, with a number of court cases being cited. The majority of courts are holding that there are substantive rights under the NEPA. However, the standard of review which is used varies depending on the court and the particular factual situation. Standards of review which are being used by the courts include a balancing analysis, the arbitrary and capricious test, a substantial inquiry, and a good faith compliance with the NEPA. The statutory sources of substantive review are sections 101, 102(1), and 102(2)B of the NEPA. In some cases by applying very strict procedural requirements, courts appear to achieve the substantive goals of the NEPA in terms of effecting changes in the Federal agency decision-making process. The decisions show that the courts are proceeding on a case-by-case basis, balancing environmental and traditional economic factors in order to achieve the substantive policies of the NEPA. (Author abstract modified)

56618 **APTIC NO. 73389**

Yamanaka, Masayoshi

PROBLEMS AND TRENDS IN ADMINISTRATION OF INDUSTRIAL POLLUTION CONTROL. *(Sangyo kogai boshi gyosei no kadai to doko). Text in Japanese. Hyojunka To Hinshitsu Kanri (Stand. Qual. Control), 28(3):1-4, March 1975.*

Problems and trends in administration of industrial pollution control are discussed. While there has been progress in the regulation of certain pollutants (such as sulfur oxides), pollution problems for which standards have not been set (such as noise and cadmium contamination of grains) present further difficulties. Problems also arise when standards are unreasonable and unenforceable, or when pollution casualties occur in spite of observance of standards. Dynamic administrative procedures are necessary which lead to prompt reexamination and revision of regulations in light of new knowledge and developments. Total pollutant amount control standards and K values are in force now for some pollutants, but technological difficulties can cause delay in adoption of more stringent standards for emission of nitrogen oxides in automobile exhaust gases. Pollutant standards are established as pollution effects are noticed, but overlapping regulations must reinforce each other, and not be overregulatory and counterproductive. Environmental assessment as well as continuous monitoring and control systems must be constantly upgraded for effectiveness. Further points under consideration include: research and development in pollution control technology; restitution to pollution victims from pollution producers; and favorable tax treatment as economic incentive for pollution abatement. Regional, national, and international cooperation is necessary. Technological advances must be shared by all.

56619 **APTIC NO. 73204**

Yoshikawa, Hiroya

ENVIRONMENTAL ASSESSMENT (PART III): CASE STUDIES IN JAPAN. *(Kankyo assumento ni tsuite (Sono III): Nihon ni okeru keisu-sutadi). Text in Japanese. Kogai To Taisaku (J. Pollution Control), 11(1):23-43, Jan. 1975. 16 refs.*

Environmental assessment by computer simulation is discussed. Cases studied in this article are: topographical changes and erosion of earth and sand in Okinawa, because of environmental destruction; preenvironmental assessment by ecological techniques; and analysis of urban environmental systems by system dynamics. Characteristics of each case are studied; points of analysis and effective analytical methods are discussed. Analytical results are then dissected, and conclusions and generalizations drawn.

56620 **APTIC NO. 73405**

Environmental Protection Agency (Japan)

AMENDMENTS TO ONE SECTION OF AIR POLLUTION CONTROL REGULATIONS. *(Taiki osen boshiho no ichibu o kaisei suru horitsu). Text in Japanese. 11p., March 1975.*

The text of amendments to the 1968 air pollution control regulations for Japan is reproduced. These amendments outline procedures by which prefectural governors can impose stricter standards on individual pollution sources within their respective prefectures in order to meet total amount pollutant control regulation standards.

56621 **APTIC NO. 73568**

DISCUSSION AND PLEDGE. *(Proposte di discussione e di impegno). Text in Italian. Doc. Ital. Nostra, vol 12:163-177, 1975 (?).*

The rate of public opinion in city planning is considered. Factors such as cultural influences on development, union and municipal considerations in the regulation of urban growth, and the pressing need to prevent further deterioration of national monuments due to urban sprawl are discussed. Efforts to preserve historical, artistic, and archaeological patrimony, as well as the natural environment of Rome, are described.

56622 **APTIC NO. 80429**

Weston (Roy F.), Inc., West Chester, Pa.

DIGEST OF THE CLEAN AIR ACT DECEMBER 1970 AS AMENDED. *51p., 1975. 6 refs.*

A digest of the Clean Air Act of 1970 is presented along with the effects of the Energy Supply and Environmental Coordination Act of 1974 on the Clean Air Act. Topics covered include: a definition of the Act, the purposes of the Act, administrative responsibilities under the Act, standard of performance under the Act, national emission standards for hazardous air pollutants, Federal enforcement procedures, inspection and monitoring activities authorized by the Act, and abatement by means of conference procedures in certain cases. A subject index to the Clean Air Act (by section) is presented along with an index to the amendments of the Act.

56623 **APTIC NO. 80856**

California Air Resources Board, Sacramento

CALIFORNIA AIR POLLUTION EMERGENCY PLAN. *Preprint, 17p., 1975. 4 refs.*

The California air pollution emergency plan is described. The plan provides a basis for taking action to prevent air pollution concentrations from reaching levels which can endanger or adversely affect the public health and for abating such concentrations when they occur. Local air pollution control districts assume the primary responsibility for taking necessary actions to curtail polluting activities. If an episode is so severe that it is beyond the local air pollution control districts capabilities of control, the state takes action to alleviate the condition under the appropriate provisions of the State Peacetime Emergency Plan developed pursuant to the Emergency Services Act. Episode and disaster response actions are described along with self-help techniques for oxidant air pollution episodes.

1974

56624 **APTIC NO. 80398**

Carter, Steve, Murray Frost, Claire Rubin, and Lyle Sumek

ENVIRONMENTAL MANAGEMENT AND LOCAL GOVERNMENT. *International City Management Assoc., Washington, D. C., Environmental Protection Agency Grant R-801374, Program Element 1HA097, Rept. EPA-600/5-73-016, 403p., Feb. 1974. 40 refs.*

A study of environmental management and local government is presented based on a survey of chief executives in cities with populations of over 10,000 and counties with populations of over 50,000 as well as field studies of local environmental management in selected areas throughout the country. Major topics covered in the study include: the perception of the definition of environment, the priority of environment as a local policy issue, types of environmental problems facing local governments, the adoption of local policy statements on the environment, the existence of citizen environmental boards and environmental control agencies, environmental sections in master plans, land use and other environmental controls, moratoria, environmental quality standards, environmental impact assessment procedures, environmental law suits, tax incentives and penalty charges, factors contributing to the development of environmental programs, and relations with state and Federal agencies. Land use is ranked by cities as the most severe environmental problem out of nine possible choices, with air pollution ranking eighth in severity. Air pollution is the only problem that varies directly with population; larger cities attach a greater severity to this problem. (Author abstract modified)

56625 **APTIC NO. 73644**

Cohen, Alan S., Gideon Fishelson, and John L. Gardner

ENVIRONMENTAL REGULATIONS AND ENERGY FOR HOME HEATING. *Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div. and Chicago Univ., Chicago, Ill., Center for Urban Studies, National Science Foundation, Research Applied to National Needs (RANN) Contracts AG-352 and GI 32989A2, 10p., 1974 (?).*

The effects of residential fuel regulations on costs to users and distributors, the price of fuels, human health and material property, and air quality are analyzed, with particular emphasis on the Chicago area. Estimates of air quality levels are generated for the Chicago metropolitan area under four policies: no control, 1% sulfur, a 1975 coal ban, and a 1975 coal and oil ban. A 100% compliance is assumed in each case. The sulfur law is sufficient to meet the Federal standards for sulfur dioxide in Illinois, whereas the Federal secondary standard of 60 micrograms/cu m for particulates is expected to be violated under any of the space-heating control policies. A cost/effectiveness analysis indicates that the net benefits of a coal ban and a combined coal and oil ban are approximately the same and are significantly higher than the other policies. A compliance date of 1975 gives higher net benefits than a 1977 compliance date. The major tangible benefits of air quality improvements resulting from a residential fuel policy are reduced incidence of human disease (chiefly respiratory) and reduced rates of soiling and corrosion of materials. A residential fuel policy does not systematically favor either high-income or low-income areas and is substantially without any racial bias. The use of coal for residential heating appears to be on a continual decline, even with alternative fuel price increases.

56626 **APTIC NO. 73621**

Davids, P.

SUCCESS OF CONTROL MEASURES ON OIL FIRINGS IN NORTHRHINE WESTPHALIA. *(Erfolge der Oelfeuerungskontrolle in Nordrhein- Westfalen). Text in German. Schornsteinfegerhandwerk, no. 4, 1974. 1 ref.*

The results of the regular inspection of oil firings in Northrhine-Westfalia and possibilities of further emission abatement are described. The regular inspections have resulted in a decrease in the percentage of firings with unacceptably high soot and oil emissions, which is approaching a limit of 10% asymptotically. The percentage of oil firings emitting oil derivatives has been fluctuating between 2 and 3% since 1966. The emissions were determined mostly by the air-excess coefficient, which is characterized by the carbon dioxide content of the flue gases. Most firings are operated currently at relatively low, unfavorable air-excess coefficients. The average specific soot emission can be reduced by increasing the CO2 content in the flue gases to 10-13%, which will also result in fuel economy.

56627 **APTIC NO. 73542**

Davis, C. M.

POLLUTION CONTROL LEGISLATION IN THE UNITED KINGDOM. *Preprint, Commission of the European Communities, Luxembourg (Belgium), 19p., 1974. 3 refs. (Presented at the Quality of the Environment and the Iron and Steel Industry Conference, Luxembourg, Belgium, Sept. 24-26, 1974.)*

Legislation controlling environmental pollution in the United Kingdom is reviewed with particular reference to the effects on the operations of the iron and steel industry. Air pollution from the main production processes in iron and steel making is controlled under the Alkali Works Regulation Act, 1906 and subsequent Orders. The Alkali Act is administered by the Alkali and Clean Air Inspectorate of the Department of the Environment and requires owners of registered works to use the best practicable means for preventing the discharge of noxious or offensive gases and for rendering such gases, where discharged, harmless and inoffensive. Air pollution fromm fuel burning processes, such as boilers, soaking pits, and reheating furnaces, is controlled by the local authorities under the Clean Air Acts 1956 and 1968. The Clean Air Acts regulates chimney heights, fumes, grit, dust, and smoke emissions. The Control of Pollution Act, passed July 1974, provides, in part, for regulations imposing requirements on the composition of fuel used in motor vehicles and regulations to impose limits on the sulfur content of oil fuels. The Health and Safety at Work Act, 1974 provides for setting up a commission to control the emission into the atmosphere of noxious or offensive substances from premises of any prescribed class.

56628

APTIC NO. 73581

Greene, J. Thomas, Frederick R. Anderson, Thomas M. Debevoise, Carroll L. Gilliam, Richard Harnsberger, Ira M. Heyman, H. Baird Kidwell, Robert Lowenstein, Henry L. Pitts, Gerard J. Turner, and Josiah Wheat

DEVELOPMENT AND THE ENVIRONMENT: LEGAL REFORMS TO FACILITATE INDUSTRIAL SITE SELECTION (FINAL REPORT). *American Bar Assoc., Chicago, Ill., Special Committee on Environmental Law, 93p., Aug. 1974.*

Guidelines for legislative reforms to facilitate industrial site selection are presented. At the state level, a siting agency with broad jurisdiction over the location of major industrial facilities is recommended. The jurisdiction includes proposals for land development posing similar siting concerns. Comprehensive and coordinated statewide planning to assure natural resource conservation is recommended along with planning criteria for evaluating proposed uses of resources in relation to developmental objectives and environmental values. Environmental impact analyses should include social, cultural, and economic considerations along with biophysical factors and allow for participation by the public, local governments, and other interested persons. Decisions made by the siting agency are recommended as subject to judicial review by the highest appelate court in the state. On the Federal level, the creation of an independent agency to review siting decisions of Federal agencies is recommended, with decisions of the independent reviewing agency being subject to judicial review in the United States Court of Appeals. A single environmental evaluation is recommended for situations where both Federal and state licenses or permits are required for proposed projects.

56629

APTIC NO. 73287

Hotzel, Edmund

THE USE OF HARD COAL AND AIR CONSERVATION. *(Verwendung von Steinkohle und Luftreinhaltung). Text in German. Glueckauf (Essen), 110(22):954-958, 1974.*

The Federal Immission Protection law enacted on April 1, 1974 combines all federal and state regulations of the past. The new law, however, is not only designed to protect the general public and the neighborhood from toxic pollution but to protect the entire environment; it aims at prophylactic measures. The law contains a number of authorizations concerning the issuance of far-reaching regulations. Of the regulations enacted to date, the hard coal mining operations are mainly affected by the regulation on limiting emissions from firing systems and by the Technical Directives for Conservation of Clean Air. Firing systems operated with solid fuels must take measures for limiting the emissions of dust, sulfur dioxide, oxides of nitrogen, and carbon monoxide. Large water pipe boilers must be equipped from now on with electrostatic precipitators which do not exceed the emission limits even if one field fails in each of the filter streets. The greytone of the smoke plume from coal-fired systems must be lighter than the greytone I on the Ringelmann scale. The emissions of SO_2 by coal-fired systems must be limited in plants of less than 4 TJ/h by the use of low-sulfur coal, and in plants with more than 4TJ/h by desulfurization of the waste gases. A detailed discussion of the implications of this demand is given. For dust, immission limits in the vicinity of such plants of 0.5 g/sq m/day (long-term value) and of 1.0 g/sq m/day (short term value) and for SO_2 limit values of 0.5 (short-term) and 0.14 mg SO_2/cu m (long-term value) were set after long debates.

56630

APTIC NO. 80408

Council on Environmental Quality and Federal Council for Science and Technology, Washington, D. C., Committee on Ecological Research

THE ROLE OF ECOLOGY IN THE FEDERAL GOVERNMENT. *78p., Dec. 1974.*

GPO 038-000-00202

Principal findings and recommendations on national needs for improving ecological understanding and its application are presented. Basic concepts in ecology are discussed and human progress and problems in relationship to ecosystems and resources are briefly highlighted. Present Federal agency involvement in ecological research is categorized. This listing allows an estimate of much of the scope and detail of what Federal ecologists have considered important. (Author abstract modified)

56631

APTIC NO. 80855

Osawa, Hideo

THE LATEST AIR POLLUTION MONITORING SYSTEM IN JAPAN. *Tokyo Shibaura Electric Co., Ltd. (Japan), Instrument and Automation Div., World Energy Conf., 9th, Detroit, Mich., 1974, p. 1-28. (Sept. 22-27.)*

Air pollution monitoring activities in Japan are reviewed. The number of monitoring stations as of January 1972 reached 497. Pollutants being monitored include: sulfur dioxide, particulates, nitrogen oxides, oxidants, carbon monoxide, and hydrocarbons. Networks of air pollution monitoring stations are established at 15 locations throughout the country. In addition to ambient monitoring activities, 16 factories in the Yokkaichi area are participating in a stationary source sulfur dioxide monitoring program in cooperation with the government. Remote monitoring techniques utilizing laser radar devices are being used to obtain data necessary for the prediction of air pollution under various meteorological conditions.

56632

APTIC NO. 80391

Simmons, William and Robert H. Cutting, Jr.

A MANY LAYERED WONDER: NONVEHICULAR AIR POLLUTION CONTROL LAW IN CALIFORNIA. *Hastings Law J., 26(1):109-166, Sept. 1974. 386 refs.*

The existing legal structure of air pollution regulation in California is explored, and certain problems are analyzed. Anomalies in the complex air pollution control laws are pointed out. The California approach and various alternative strategies are examined. Statewide criteria for the quality of the air have been set, and then either emissions or performance standards have been implemented to reach the targeted levels. Alternative strategies include unequal standards, subsidies, tax incentives, the effluent charge, and the pollution rights theory. The components of air pollution control include the county air pollution control district (APCD), the unified APCD, regional APCD s, basinwide air pollution control coordinating councils, local authorities, and the State Air Resources Board. Functional aspects of air pollution control are considered, including the basic structure of air quality management, programs and enforcement, administrative aspects, general civil sanctions, criminal sanctions, variances, APCD enforcement methods, the Air Resources Board s role in enforcement, and jurisdictional problem areas. Some of the problems with, and tensions in, the existing scheme are explored.

56633

APTIC NO. 73450

Utsunomiya, Makoto

UNLEADED GASOLINE. *(Gasorin no muenka ni tsuite). Text in Japanese. Sangyo To Kankyo (Ind. Environ.), 3(12):33-38, Dec. 1974.*

Comments are offered on the gradual transition to unleaded gasoline in Japan, announced by the Ministry of International Trade and Industry, on September 30, 1974. The date for complete transition to unleaded gasoline is still under advisement. No more tetraethyl lead is to be added to regular gasoline as of February 1, 1975. Premium gasoline will still contain lead. The public is to be informed (by mass media, direct mailing, and caution labels) of the ramifications, and automobile and petroleum industries should offer their leadership and cooperation. Most farm, logging, and construction machinery in present use will need to be run on a mixture of premium and regular gasoline, since lead is a necessary lubricant. Users of automobiles must be made aware of the kind of gasoline to use with their machines (leaded premium, unleaded regular, or a mixture of both). Conversion of cylinder heads to use unleaded gasoline will be carried out on request, almost at cost, but the minimum cost would still be $133-$166, making this procedure impractical as a voluntary gesture. As in all pollution countermeasures, the recurring problem is who is to bear the cost of cleanup. Complete pollution elimination at any cost is a fallacy. Also, pollution countermeasures themselves must not produce worse pollution. Reasonable but positive approaches to pollution problems must be undertaken under a national consensus.

56634

APTIC NO. 79883

Van Dongen, David

LEAD CONTENT OF LOW-LEAD GASOLINE IN THE BUFFALO AREA. *New York State Univ., Buffalo, Dept. of Chemical Engineering, National Science Foundation Grant, Rept. SS-402, 26p., Jan. 1974. 4 refs.*

NTIS: PB 236942

Low lead gasoline samples were collected from gasoline stations in the Buffalo area to assess the effectiveness of a municipal ordinance calling for the sale of low-lead gasoline. Only one sample of 14 collected and analyzed exceeded the upper limit of 0.5 g of lead/gallon; the lead level in this sample was 0.86 g/gallon. Many of the stations were not receiving any low-lead gasoline shipments over the last several months. Many of the low-lead gasoline samples collected were dyed to aid in the distribution of this gasoline without any contamination. (Author abstract modified

56635

APTIC NO. 73583

Visalli, Joseph R.

A PROPOSED AMBIENT AIR QUALITY SAMPLING STRATEGY AND METHODOLOGY FOR THE DESIGN OF SURVEILLANCE NETWORKS. *Purdue Univ., Lafayette, Ind., Dept. of Civil Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-15,253, 1974, 278p. 64 refs.*

An ambient air quality sampling strategy and methodology for the design of surveillance networks is proposed. Using one month (February 1973) of hourly averaged sulfur dioxide concentrations and meteorological data obtained from the Wayne County, Michigan area, two impulse response regression models are developed that relate the dependent variables spatial concentration and spatial variance of SO2 concentration at any time to the meteorological factors that influence the variation in these variables. Modeling the latter random variable forms the basis of the sampling strategy. The time constants of a Fourier-filtered and non-filtered log-linear meteorological air pollution dispersion system are found using the cross-correlation function. These in turn are used to choose meteorological variables at specific lag periods which maximize the linear correlation between the dependent and meteorological variables. This approach results in regression models which account for up to approximately 85 and 75% of the variance inherent in the dependent variables, respectively. The remaining variation can be considered as approximate while noise at the 95% confidence level. The system's identification procedure indicates that emissions variations can be considered as a stationary random process over a period of 1 month. Power spectral analysis of the data indicates that mesoscale meteorological measurements are sufficient for correlation purposes if sampling periods of equal to or greater than 1 hr are employed. If no systems modeling effort is to be considered and a sampling period equal to or greater than 1 hr is desired, then the sampling period for monitoring ambient SO2 concentrations should be on the order of 24-48 hr. Long period (low frequency) synoptic time scale weather phenomena appear to have the greatest effect on SO2 concentrations measured at sampling frequencies of equal to or greater than 1 cycle/hr.

56636

APTIC NO. 73209

Kure Municipal Office

ORDINARY NETWORK OF MONITORING AND SURVEILLANCE AND ITS EMERGENCY MEASURE. *(Joji kanshi taisei to Kinkyuji no sochi). Text in Japanese. Kureshi ni Okeru Kogai no Genjyo to Mondaiten (Present Situation Relat. Probl. Environ. Pollut. Kure City), no. 3:5-8, 1974.*

An air pollution monitoring and surveillance system including a central control station, a major relay station, a sub-relay station, and several local monitoring stations was established. Air pollution and meteorological data obtained at 7 monitoring stations are transmitted to the Central Control station through the two relay stations. The Central Control Station issues cautions and warnings on air pollution to nearby local municipal offices and to major industries. Forecast, caution, and warning for sulfur dioxide, oxidants, nitrogen dioxide and carbon monoxide are issued when the concentrations reach certain levels. The one-hour values for forecast, caution, and warning of oxidants are 0.10 ppm, 0.15 ppm and 0.5 ppm, respectively. Those for caution and warning of NO2 and CO are 0.5 ppm and 1.0 ppm, and 30 ppm and 50 ppm, respectively. Requests for cooperation are given to major industries and traffic controls are enforced in time of emergency.

56637

APTIC NO. 73406

Mie Prefectural Government (Japan), Div. of Environment

ENVIRONMENTAL POLLUTION CONTROL PLAN FOR YOKKAICHI REGION. *(Yokkaichi chiiki kogai boshi keikaku). Text in Japanese. In: 49-Nendo Mie-ken Kankyo Hakusho (1974 Mie Prefecture Environmental White Paper), p. 221-227, Dec. 1974.*

A description is given of the updated Yokkaichi Regional Pollution Control Plan, which initially received first order of priority among regional environmental pollution control planning measures of December 1970. Reexamination and refinement of the plan is being undertaken, and the new plan should be authorized during 1974. Goals and time schedules for counteracting air, water, noise, malodor pollutions, and excessive ground settling are listed. For the four years from 1974 to 1977, a total of $357 million from government and private sources has been budgeted toward pollution countermeasures.

56638

APTIC NO. 73407

Mie Prefectural Government (Japan), Div. of Environment

ENVIRONMENTAL POLLUTION GRIEVANCES AND COMPLAINTS. *(Kogai funso to kujo). Text in Japanese. In: 49-Nendo Mie-ken Kankyo Hakusho (1974 Mie Prefecture Environmental White Paper), p. 271-275, Dec. 1974.*

Four methods of dealing with pollution-related complaints in Mie Prefecture, Japan, are described. Pollution is separated into six types: air; water; soil; noise-vibration; excessive ground settling; and malodor. Litigation can be instituted against the offending enterprise (e.g., 6 citizens vs. Onoda Cement KK, May 1973). A 13-member pollution investigation committee was established in November 1970, whose members serve staggered 3-year terms. The committee resolved 3 cases in 1971, handled one case in 1972, and no cases in 1973. Complaints and petitions can be handled by prefectural or local agencies (1953 complaints in 1973, a decrease of 5% from 1972). In Mie Prefecture, malodor complaints comprised the great bulk of pollution grievances. A decrease in malodor and atmospheric pollution complaints occurred in 1973, but there was an increase in noise-vibration and water quality complaints. About 50% of the complaints came from Yokkaichi City. According to regulations of October 1971, citizens can request a survey of pollution conditions. Four requests were handled in 1972, and three in 1973.

1973

56639 **APTIC NO. 79856**

Maraist, Frank L.

AIR POLLUTION (AIR QUALITY STANDARDS). *In: Laws Relating to Environmental Control. Part 2 of 2 Parts. Oxford, Miss., Mississippi Univ., 1973, p. 212-259. 327 refs.*

Mississippi laws dealing with the control of air pollution are reviewed. Topics discussed include: regulations dealing with the limitation of particulate and gaseous combustion products from fuel burning, open burning, and incineration; regulations for the contro of industrial emissions; air pollution emergency episodes; air pollution alerts; air quality warning and emergency levels; and industrial permit regulations for new and existing facilities.

56640 **APTIC NO. 73662**

Mikolowsky, W. T., J. H. Bigelow, B. F. Goeller, and J. K. Ives

A TRADEOFF MODEL FOR SELECTING AND EVALUATINNG REGIONAL AIR QUALITY CONTROL STRATEGIES. *Rand Corp., Santa Monica, Calif., Environmental Protection Agency and San Diego Environmental Development Agency Contract 6704-0270-E, Rept. R-1367-SD/ Appendix 5, 77p., Dec. 1973. 16 refs.*

NTIS: N74-31092

A computer-based tradeoff model that evaluates alternative strategies for meeting regional air quality standards, selects minimum total cost strategies, and analyzes the sensitivity of the results to key assumptions is described, with particular emphasis on its application to the San Diego area. Regional air quality control strategies in the tradeoff modell consist of three primary components: fixed-source controls (including aircraft), retrofit control devices and inspection/maintenance policies for in-use vehicle, and transportation management controls. The cost and effectiveness of the fixed-source controls and various retrofit-inspection/maintenance strategies are determined by separate analyses and are subsequently provided as inputs to the tradeoff model. A policy-oriented transportation model is incorporated as a subroutine to estimate the effects of transportation management controls. A typical run of the tradeoff model in the evaluation mode requires about 15 sec. The tradeoff model is designed to be transferable to other regions with relatively little difficulty; only a few weeks are required to transfer it from the San Diego to the Los Angeles region. (Author summary modified)

56641 **APTIC NO. 73401**

Kyoto City Office of Environmental Pollution Countermeasures (Japan)

ON RESULTS OF CAMPAIGN TO PROTECT BLUE SKIES. *(Aoi sora o mamoru undo no kekka ni tsuite). Text in Japanese. In: Kogai Kankei Koho Shiryoshu (Collection of Data and Information Related to Environmental Pollution Control), p. 3-6, 1973.*

Results are described of the Campaign to Protect Blue Skies, a citizens effort, which was conducted from November 1972 through March 1973 in Kyoto City, Japan. A decrease in the concentration of sulfur oxides was found, but probable causes lie in stricter pollution regulations, rather than citizen involvement. Automobiles were checked for emission violations in two street surveys, taken 4 mo apart during this time. A total of 1435 vehicles were inspected, of which 500 vehicles did not meet emission standards. Of these, 215 vehicles were issued notices by prefectural police to correct excessive carbon monoxide emission.

56642 **APTIC NO. 73402**

Kyoto City Office of Environmental Pollution Countermeasures (Japan)

ON 1973 COUNTERMEASURES FOR ATMOSPHERIC POLLUTION DUE TO PHOTOCHEMICAL REACTIONS (PHOTOCHEMICAL SMOG). *(Showa 43-nendo kokagaku hanno ni yoru taiki osen (kokagaku sumoggu) taisaka ni tsuite). Text in Japanese. In: Kogai Kankei Koho Shiryoshu (Collection of Data and Information Related to Environmental Pollution Control), p. 7-8, 1973.*

Photochemical smog countermeasures under consideration in Kyoto City, Japan are described. Kyoto City had its first photochemical smog alert on August 8, 1972. From May to October 1973, citizens are to be made aware of what photochemical smog is. Six continuous monitoring stations are to be established, with supplemental mobile monitoring units. A communications network to inform the public of the smog alert is to be established. Both self-restraint and regulatory restraint will be imposed as necessary on factories, businesses, and automobile users. Medical treatment procedures for smog victims will be established. Current emission regulations are reviewed.

1972

56643 **APTIC NO. 80891**

Fuller, H. I.

REVIEW OF EUROPEAN AIR POLLUTION CONTROL MEASURES. *Inst. for Industrial Research and Standards, Dublin (Ireland), Air Pollution Symp. Proc., Dublin, Ireland, 1972 p. 7-37. 17 refs. (March 22.)*

The pattern of control and regulation of air pollution in European countries in 1971 is reviewed. The salient features of control measures in a number of countries are described, compared, and contrasted in an attempt to determine common features and reasons for differences. Some countries have a long history of legislation concerning air pollution. The Swedish basic law for Environmental Protection places responsibility for taking preventive measures on the person whose activities may potentially harm the environment. A highly organized structure is evidently developing in Germany, with scope for taking into account all available technical information. The air pollution control pattern in Italy is still relatively new. The central authorities have formulated and introduced a number of significant regulations. More time will probably be needed before local and regional organization for surveillance and enforcement reaches full effectiveness. Control of air pollution is in the hands of many different groups in the United Kingdom. The responsibilities for policy formation, legislation, surveillance, and enforcement seem almost deliberately to have been separated among these groups, but well established traditions and the widespread consensus for moderated action apparently provide the necessary cohesion. A new Ministry of the Environment has been established in France to modernize present regulations and to provide coherence for the efforts currently spread among many organizations. Norway established a Smoke Control Council in 1961. Swiss Cantonal prerogatives have just been transferred to a Federal Department for Environmental Conservation. The patterns of enforcement also differ.

56644 **APTIC NO. 80892**

Page, J. K.

SELECTING AN AIR POLLUTION CONTROL POLICY. *Inst. for Industrial Research and Standards, Dublin (Ireland), Air Pollution Symp. Proc., Dublin, Ireland, 1972, p. 39-65. 3 refs. (March 22.)*

It should not be necessary for any other country to go through the kind of atmospheric pollution experiences that the industrial areas of England went through from the beginning of the industrial revolution until corrective measures were instituted recently. There has been a very dramatic improvement in the environment through the application of the new legislative machinery introduced by the Clean Air Act. Air pollution control policy is discussed, including measurements, biological tolerance, legislation, enforcement, and deterrents. The points in the control cycle at which control measures can be taken are discussed. Planning must take into account that both the horizontal and vertical location of pollution can be controlled. Education of the public is discussed. All pollution control policies need to be founded on a proper economic basis. It is very important that technologists concerned with pollution control not only recognize the very important nature of the political decisions involved in this field, but also that they understand the administrative control cycles and the social support that is needed from the public.

1971

56645 **APTIC NO. 80875**

Davies, David Arthur

MONITORING THE ATMOSPHERIC ENVIRONMENT. *World Meteorological Organization, Geneva (Switzerland). Int. Conf. Environ. Future Proc., 1st, Finland, 1971, p. 103-129. 8 refs. (June 27-July 3.)*

The meaning of the terms atmosphere and environment is discussed. An atmospheric monitoring system is needed because atmospheric processes have a pervasive influence upon human life, and because humans are changing the composition of the atmosphere. The aim of the atmospheric monitoring system must be to observe, collect, and process data of appropriate atmospheric parameters. The World Meteorological Organization plan for a global network of stations to measure background air pollution is described. Baseline air pollution stations would document long term changes in atmospheric composition that are of particular significance to weather and climate. They must be located far from major population centers, major highways, and air routes. A minimum of one regional air pollution station/500,000 sq km of land is envisaged. A complex global telecommunication system is essential for the collection of the data at global and regional centers and their retransmission within a few hours to individual national centers several times daily. The precise data processing requirements have yet to be established. Future monitoring needs are also discussed. An atmospheric monitoring system for biological purposes must be coordinated fully with other atmospheric monitoring systems.

1965

56646 **APTIC NO. 73526**

Gaffney, Mason

APPLYING ECONOMIC CONTROLS. *Bull. At. Sci., vol. 22:20-25, June 1965.*

The application of economic controls to air pollution abatement is discussed, with particular emphasis on the tax mechanism. If air is regarded as a common domain to be managed under public tenure, then invasions of the domain by polluters may be regarded as trespass and the cost of control assigned to the polluter. Taxation can be employed in the form of write-offs for control equipment, fuel taxes, and taxes on property designed to encourage fast replacement of outmoded equipment that pollutes the air. Other socio-economic control measures for air resource management include royalties on polluters and planning and zoning.

SOCIAL ASPECTS

1975

56647 **APTIC NO. 80779**

Jonsson, Erland, Margaret Deane, and George Sanders

COMMUNITY REACTIONS TO ODORS FROM PULP MILLS: A PILOT STUDY IN EUREKA, CALIFORNIA. *Environ. Res., 10(2):249-270, Oct. 1975. 7 refs.*

A study was performed in Eureka, California to determine whether it is possible to demontrate the relationship between quantitative data describing exposure to odorous pollutants and data describing community reactions. Three residential areas were chosen that were presumed to have different exposures to odors on the basis of location with respect to pulp mills and prevailing offshore winds. The exposure to odor in the three areas was estimated by dynamic olfactometry. The questionnaire and interviewing techniques are described. Obvious differences occur between the three areas with respect to how often the respondents notice the pulp mill odors. Annoyance reactions also varied. Their implications were studied by examining the relationship between symptoms and annoyance and measuring spontaneity in mentioning the odor and attempts to change exposure to it. Background variables probably did not account for the area differences. Results from dynamic olfactometry agree with the presumed exposure of the areas to pulp mill odor as well as with the annoyance reactions of the residents of each area. If the respondents are aware of the real purpose of such a survey they may tend to exaggerate annoyance reactions in an attempt to force community action to reduce the environmental irritant. To avoid this, the purpose of this study was masked.

GENERAL

1975

56648 **APTIC NO. 80576**

Field, A. A.

CHIMNEYS FOR INDUSTRIAL BOILER PLANT. *Energy World, no. 14:7-9, March 1975. 6 refs.*

The design of chimneys for industrial boiler plants is discussed based on the provisions of the Clean Air Act Memorandum in 1963. The basic dimensions of the chimney, height and diameter, are related both to the dispersal of gases in the atmosphere, and to the needs of the fuel burning equipment. The Clean Air Act Memorandum fixes the height of the chimney in relation to the rate of discharge of sulfur dioxide and the prevailing level of SO2 in the district. The exit gas velocity at the top of the chimney must be high enough to prevent downwash of gases on the lee side of the chimney, and high enough to prevent inversion. The memorandum gives a lower limit of 6 m/s for natural draught installations, and up to 15 m/s for mechanical draught. Designing a natural draught chimney requires the buoyancy force to be balance against the resistance of the system, whereas with mechanical draught, the fan supplies most of the motive power.

56649 **APTIC NO. 80583**

National Academy of Sciences, Washington, D. C., Commission on Natural Resources and the National

Research Council, Washington, D. C., National Academy of Engineering

CONTROL OF AMBIENT SULFUR DIOXIDE CONCENTRATIONS WITH TALL STACKS AND/OR INTERMITTENT CONTROL SYSTEMS. *In: Research and Development Relating to Sulfates in the Atmosphere. 94th Congress (House of Representatives), First Session, Serial F, p. 163-170, June 1975. (Prepared for the Subcommittee on the Environment and the Atmosphere on the Committee on Science and Technology.)*

GPO

The use of tall stack/intermittent control system technology as an alternative to flue gas desulfurization systems is discussed in relation to meeting ambient air standards for sulfur dioxides. Tall stacks and intermittent control system methods generally appear to be effective in reducing the number and extent of excess concentrations of sulfur dioxide in the vicinity of single isolated sources. The National Ambient Air Quality Standards for sulfur dioxide have been met at the Tennessee Valley Authority s Paradise steam generating plant since the initiation of ICS controls in 1969. Emission reductions are necessary at Paradise 0.5% of the year. System reliability in an ICS program is a function of the accuracy of air quality forecasting. Costs for implementing the tall stack-ICS approach are significantly less than comparative costs for flue gas desulfurization systems, although regulatory agency expenses for monitoring and enforcing ICS programs represent hidden costs of control. Much of the controversy surrounding the implementation of the tall stack-ICS approach is associated with the impact of this technology on acid-sulfate aerosol and the effects of these aerosols on human health. Major disagreements exist in interpreting the limited data base available for understanding this issue.

1974

56650 **APTIC NO. 73197**

Iwasaki, Kaoru

AIR POLLUTION, ESPECIALLY PROBLEMS WITH NITROGEN OXIDES. *(Taiki osen, toku ni chisso sankabutsu no mondai ni tsuite). Text in Japanese. Waseda Daigaku Shisutemu Kagaku Kenkyusho Ho (Rep. Syst. Sci. Inst., Waseda Univ.), no. 28:79-82, Nov. 1974. 3 refs.*

Formation and removal of nitrogen oxides are discussed in high school textbook terms. Emission standards for nitrogen oxides for 1975 and 1976 in Japan are listed.

1965

56651 **APTIC NO. 73512**

Haagen-Smit, A. J.

PUBLIC APATHY IS GREATEST AIR POLLUTION PROBLEM. *Chem. Eng. News, vol. 43:99, 101-103, 105, April 12, 1965. (Presented at the American Chemical Society, Southern California Section, Los Angeles, Calif., April 7, 1965.)*

The urban air pollution problem is reviewed in the context of previous abatement legislation and the importance of public concern in stimulating increased air resource management. Automobile exhaust emission controls that resulted from research in response to the Los Angeles smog problem are cited as evidence that delay in air pollution control is not due to a lack of engineering know-how but rather to apathy in government and among the public. The need for public education concerning the adverse health and economic effects resulting from air pollution is emphasized.

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